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A. R. ELLIOTT, President.

CASWELL A. MAYO, Ph.G.....Editor.
THOMAS J. KEENAN .....Associate Editor.
IRVING J. BENJAMIN.....Business Manager.

Chicago Office, 221 Randolph Street.
ROMAINE PIERSON.. .. ..Manager.

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WE desire every druggist who is not already a subscriber to the AMERICAN DRUGGIST, and who receives a specimen copy of this issue, to consider it an invitation to subscribe. The *special subscription offer*, which is printed on pages 86 and 87 of our advertising columns, gives a list of the premiums which we are enabled to send to new subscribers by special arrangement with the publishers of the books and the manufacturers of the graduated measures which can be selected by the subscriber. No such generous offer has ever been made by the publishers of any drug journal, and the AMERICAN DRUGGIST hopes that no one who is eligible will neglect it. To repeat the terms of this special subscription offer, we will say that to any person who is not already a subscriber to the AMERICAN DRUGGIST, who sends $1.50 for a year's subscription, we will send the AMERICAN DRUGGIST for one year and free of charge and postage prepaid any one of the five popular books named in the advertisement, the retail selling price of which is alone $1.50. We have been able to make a slightly better arrangement with the manufacturers of the graduates, and on receipt of $1.50 for a year's subscription we will send free of charge and postage prepaid a set of graduates ordinarily listed at $2.50.

1800—1900.

THE history of the growth and development of pharmacy in its more scientific aspects during the past hundred years is one of absorbing interest. It is a record of progress unexampled in any other trade, art or science. The history of chemistry is indissolubly bound up with that of pharmacy proper, and both pharmacy and chemistry have progressed steadily along lines of exactitude leading to precision and definiteness; it is because pharmacy is so much the debtor to chemistry that any record of one would be incomplete without the other.

With the aim of preserving a record of the notable achievements of the nineteenth century the editors of the AMERICAN DRUGGIST early in the year enlisted the foremost students and teachers of pharmacy and its allied arts and sciences to prepare the written record of the cycle, and the result is to be seen in the pages of this issue. We shall not attempt to retraverse here the ground covered in detail by our contributors, excepting to point out the distinctive features of the interesting study which is given in the series of articles composing this number.

Text Books and Drug Journals.

The series opens with the article on "Pharmaceutical Literature and Journalism," by Dr. Fred. Hoffmann, of Berlin, who possesses special qualifications for the work of the historian of pharmacy, and especially for recording the history of the development of pharmacy in the United States of America, where he spent the third of the century as practicing pharmacist, State chemist, and a pharmaceutical editor, always the close student and observer of the drift of pharmaceutical affairs and the changing conditions and development of the craft.

The earlier efforts to establish a national pharmacopœia, as referred to by several of the writers in this series, were suggestive of the awakening spirit of the beginning of the century, for from these efforts may be traced the first steps taken to place pharmacy upon a professional and scientific basis. The appearance of the Dispensatories marked a great step forward; then came the drug journals and the general development of American pharmaceutical literature, coincidentally with the institution of colleges of pharmacy. Much of the matter contained in Dr. Hoffmann's article is statistical in its nature, but it has an all absorbing interest for every one having any connection with pharmacy. The references to pharmaceutical text books are not so numerous as one would expect, considering the period of time which has elapsed since the publication of the first American text book of pharmacy in 1855. Only the principal text books are included, of course, but the list will impress the reader as a meager one, considering the relatively greater production of books dealing with the allied science of pharmaceutical chemistry and of analytical chemistry as applied in pharmacy. It is the first time, we believe, that any attempt has been made to present a complete bibliographical history of the pharmaceutical press of the United States. This task, for which Dr. Hoffmann is so well equipped, has been admirably executed, and the growth and development of pharmaceutical periodicals in this country especially has been well described. The pioneers in American pharmaceutical journalism were nearly all of them personally known to the author, which fact gives him exceptional advantages for the work he has undertaken. The list of journals which he enumerates is a lengthy one, and will surprise many of our readers by the catalogue of periodicals which have "abode their destin'd hour, and went their way."

The Discovery of Percolation.

Emphasis to the above is given by Professor Remington in the second article of the series, where the progress of manufacturing

pharmacy is touched upon, together with the historical developments in galenical pharmacy, or the preparation of vegetable medicines. The invention of machinery for the comminution of roots, barks and herbs quickened progress materially, but galenical pharmacy, as Professor Remington points out, received its greatest impulse from the discovery of the process of percolation. He goes so far, indeed, as to credit the discovery of the principle of exhausting drugs by percolation with developing the science of pharmacy more than any other single factor.

We owe the discovery of percolation to France, but the world owes the application of the process to America. Fluid extracts, as Professor Remington observes, were impossible, save for the discovery of percolation; and fluid extracts are an exclusively American production, being originated and their use fostered here. The conservatism of European pharmacists operated for a long time to discourage the application of the process or the introduction of the method into the pharmacopœias of Europe, but the value of percolation, as compared with maceration, has steadily gained recognition, until it is now an official process of the British Pharmacopœia, and is prescribed in the French Codex.

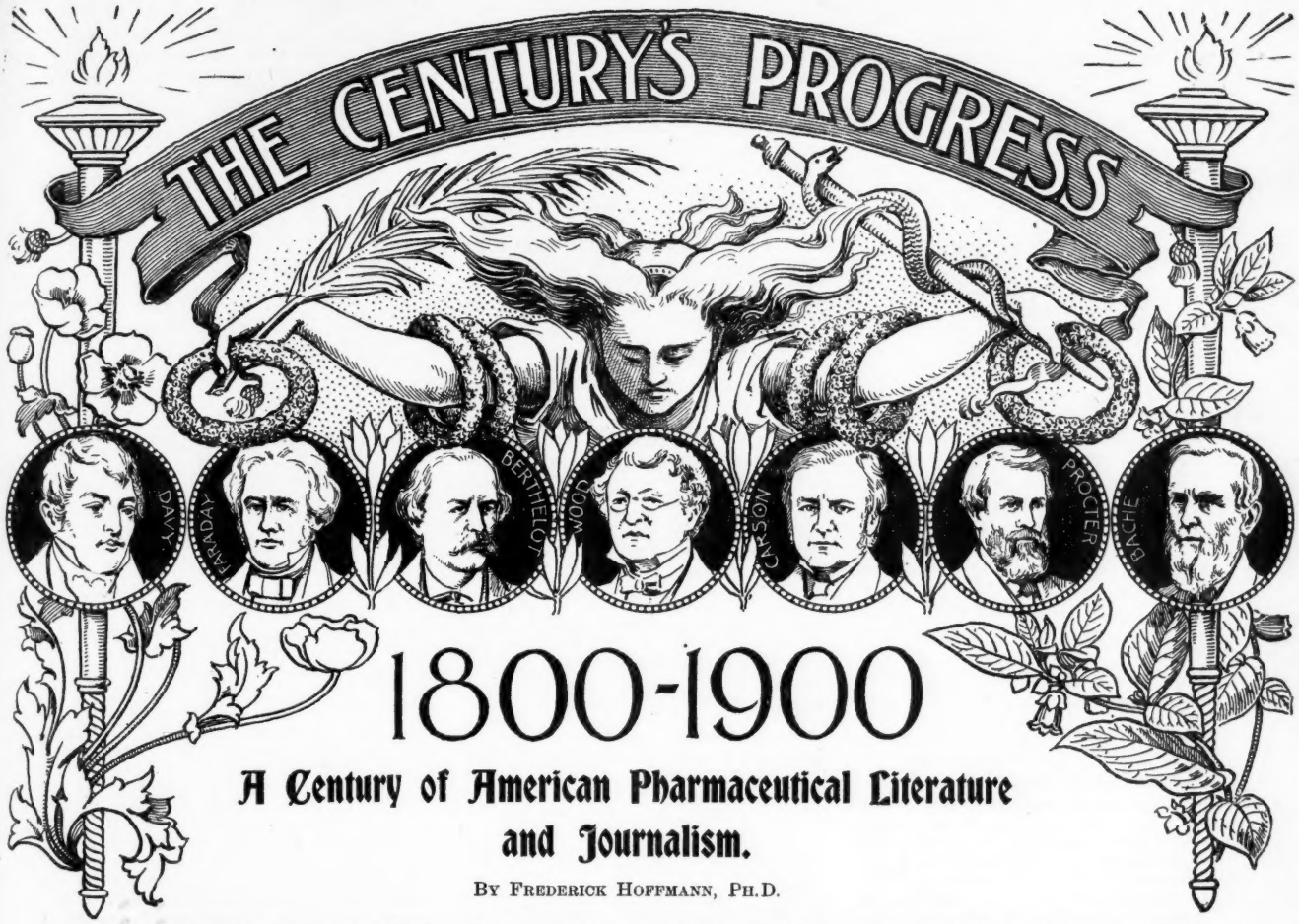
New Solvents in Pharmacy. The influence of the use of alcohol as a solvent and preservative has been felt particularly in the domain of galenical pharmacy, while the solvent powers of glycerin have been utilized considerably in the extraction of drugs which contain tannin or allied principles. It is probable, as indicated in Professor Remington's article, that the manufacture of fluid extracts by the retail pharmacist has almost wholly fallen away, but the trend of pharmacy in other directions has nearly, if not quite wholly, balanced this loss of familiarity with working processes which are of so much importance to the pharmacist. Many new drugs and applications of drugs have been discovered since the process of percolation reached its most extended use, and in the newer manipulations of the practical pharmacist, and in the increasing demands of these end-of-the-century-days on his knowledge of the chemical constitution of drugs, are found many new fields for his endeavor and application.

The Microscope. The introduction and application of the microscope in pharmacy was a matter of slow accomplishment. Probably the first mention of the use of this instrument, as a means for detecting the adulteration of drugs, is to be found in the "American Journal of Pharmacy" for 1853. No real progress in the direction of its practical application in pharmaceutical research was made, however, until many years after this. Now and again a voice would be heard lifted up in advocacy of its use. Dr. Edward R. Squibb recommended the use of a cheap microscope for the examination of rhubarb root at a meeting of the American Pharmaceutical Association, held in 1868; while at the same time Dr. Fred. Hoffmann called attention to the value of the instrument "as an indispensable instrument for detecting substitution and adulteration in drugs and many articles used in trades and for domestic purposes." The importance of the use of the microscope in pharmacy is now indisputable, and the third article in our present series, which is from the pen of Prof. Albert Schneider, the author of "Microscopy and Micro-technique," will be found most exhaustive in its treatment of the subject, and to amply repay a careful perusal. The use of the microscope in pharmacy is probably the most modern development of all, and it is difficult to reconcile the older schools of pharmacy to its use, who see in it only a refinement of pharmacy which can never become of practical value to the user. The microscope is, however, now as indispensable to the student and practitioner of pharmacy as any pill tile or percolator; it has a well defined place in pharmaceutical teaching institutions, in pharmaceutical industries and in the literature of pharmacy; and the conservatism of the older pharmacists will have to give way in this as in many other things to modern ideas and progress.

The History of Organization. Among the articles which reached us too late for use in this number was one by Thomas V. Wooten, the secretary of the National Association of Retail Druggists, who undertook for us a study of the various national movements to protect and foster the commercial interests of the retail drug trade. An interesting account of certain aspects of these movements is contained in the paper by M. N. Kline, who served for so long a time as Chairman of the Committee on Proprietary Goods of the National Wholesale Druggists' Association; and in the "Retrospect," by J. W. Colcord. The organization of the National Association of Retail Druggists may be fairly regarded as one of the prominent achievements of the century. The new association began its life at a time when every retailer felt the blush of shame as he contemplated an injustice, real or imaginary, to which he had been obliged to submit. The relations between the different branches of the drug trade were strained almost to the breaking point, and the feeling against manufacturers particularly was vengeful in the extreme. This feeling had its origin in other sources besides the imposition of the war revenue tax. The advent of dry goods, grocery and general stores as competitors in the sale of proprietaries was looked upon by druggists as an encroachment of their rights which had the sanction of the manufacturers, and to a certain extent the jobbers, and the feeling of bitterness extended also to the latter.

Accomplishments of the N. A. R. D. The gains of organization have been solid. One hundred and sixty State and local associations have been organized into one compact body; prices on proprietaries and other goods have been restored in localities where chaos has long reigned; satisfactory methods of doing business have been established in towns and cities where it has associations, and many local abuses have been corrected. Finally the spirit of hopefulness has been restored; the trade is beginning to feel its power and the enthusiastic determination to place the drug trade again in the highway of commercial prosperity is growing daily. These are some of the accomplishments of the N. A. R. D.

The Promise of the New Century. We have drawn for our readers a picture of pharmacy at the beginning of the nineteenth century, and contrasted therewith the conditions existing at its close. In 1800 pharmacy was merely in embryo as regards its professional and scientific status. In 1900 we find the pharmacist a man of considerable scientific attainments, of good social standing, and occupying a position of responsibility and confidence in the estimation of the public. The commercial conditions, while momentarily disturbed, are on the whole vastly superior to those heretofore existing in pharmacy, and as we see the earnest helpful work of the leaders, as we realize the magnificent fields of usefulness in the direction of scientific endeavor which open out before the pharmacist at the beginning of the twentieth century, we feel confident that when some future editor of the AMERICAN DRUGGIST opens another century with a review of the progress of the hundred years upon which we are about to enter, the improvement in the condition of pharmacy, the development in its scientific aspects and the elevation of the position of its followers will be quite as great as that which is here chronicled.



1800-1900

A Century of American Pharmaceutical Literature and Journalism.

By Frederick Hoffmann, Ph.D.

THE development of the periodical press in North America, particularly in the domains of applied sciences and the arts, was a comparatively tardy one, and it could be neither extensive nor representative so long as public and associate interests and activities in the common affairs of professional, commercial and trade life were slack and passive, or until a prompt mail service and other requisite expedients for publication had been established. Whatever literary material was in demand during the colonial period of our country was obtained with other commodities of commerce from the mother country, among them medical supplies, instruments, books, etc., requisite to the trained practitioner.

The Inception of a Pharmacopoeia.

Although among the shops for common supplies some drug stores were in existence in the principal cities of the Atlantic border provinces about the middle of the eighteenth century, a distinct profession of pharmacy seems not to have existed before the first decade of the present century. The practitioners of medicine, largely empirics, dispensed medicines, purchasing their supplies from shops where drugs and medicines, paints, varnishes, hardware and other goods were sold over the same counter. These dealers again obtained their stock from the wholesalers, who imported a wide variety of goods including drugs and chemicals from abroad. As during the eighteenth century there existed no American medical or pharmaceutical standard works, British, French and German books were indiscriminately used as literary authorities in the practice of medicine and as reference compends in materia medica and pharmacy. For these professions and as a starting point for the production of a native pharmaceutical literature the creation of an American pharmacopœial standard became a paramount requirement, especially after the realization of national independence. Any report on the progress of American pharmaceutical literature needs, therefore, to be prefaced by a brief reference to the initiatory development of the United States Pharmacopœia and of the early American Dispensatories.

American Pharmacopoeias and Dispensatories.

After the establishment of political independence in 1776 more than one generation had to pass away before a spirit of divergence and of emancipation from traditional standards could assert itself in medical circles. It is a remarkable fact that the preliminary steps for the formation of an American pharmacopœia* were taken, not in Philadelphia—then the intellectual and commercial metropolis of the young and rising commonwealth—but in Boston, where, as is well known, the first impulse was given to the final realization of the independence of the United States of America.

The First Pharmacopoeia.

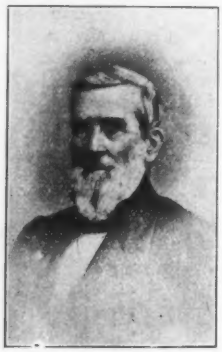
The Massachusetts Medical Society, established in Boston at the end of the eighteenth century, resolved in October, 1805, to replace the British standards as represented by the London, Edinburgh and Dublin pharmacopœias and dispensatories then in common use by an American pharmacopœia. A draft for such a work was elaborated by a committee and approved and published in 1808 under the title, "The Pharmacopœia of the Massachusetts Medical Society." It was stated in the preface of the book that the object of its preparation and publication was the establishment of a common standard for the practitioners of medicine and pharmacy, so that the names, the composition and strength of the medicinal preparations and drugs might be uniform.

For want of any legal control of the quality of drugs and medicines, as well as of the qualifications of the practitioners of medicine and pharmacy, little respect seems to have been paid to this initial American pharmacopœia, which utterly failed of any wider than a local circulation.

Dissensions among the various sects of medical practitioners and the rivalries arising among the States and cities of the young Republic seem to have frustrated all early efforts towards a

* The diminutive formulary published at Lititz, Lancaster County, Pa., by Wm. Brown, M.D., surgeon in the Federal army, in 1778, although entitled, "Pharmacopœia Simplicium et Efficaciorum in Usum Nosocomii Militaris ad Exercitum Fœderatarum Americæ Civitatum," cannot properly be considered to be a precursor of the United States Pharmacopœia. This small formulary was intended exclusively for the use of surgeons in the few temporary hospitals during the Revolutionary War.

common and uniform action of the various medical associations formed in the course of the early years of the century. In 1816 there appeared in New York another formulary elaborated by Drs. Sam. L. Mitchill and Val. Seaman and issued "by the physicians and surgeons of the New York Hospital," under the title, "Pharmacopœia Nosocomii Neo-Eboratensis, or, The Pharmacopœia



FRANKLIN BACHE,
Editor of the First "U. S. Pharmacopœia."

of the New York Hospital," which contained in an appendix a full list of English and Latin names and synonymes, and of maximal doses of potent remedies.

Moving for a National Pharmacopœia.

The sectional feeling then existing among the rank and file of the practitioners of medicine and the evident failure of the Boston and New York pharmacopœias to meet with adoption and use beyond a local circle, induced an eminent practitioner, Lyman Spalding, M.D., of the New York County Medical Society, to issue in 1818 a call to the recognized medical societies to send delegates to a conference in Washington, D. C., in January, 1820, for the preparation of a national pharmacopœia. Twelve medical societies and seven medical colleges consented to be represented. The draft presented at a preliminary meeting of the delegates of the societies of the Northeastern States held in Boston in 1819 was approved, while at another meeting of delegates of the Middle States held in Philadelphia at nearly the same time two drafts were presented, which were consolidated at a subsequent meeting of delegates at Washington in 1820. This joint work was accepted and published in December, 1820, under the title, "The Pharmacopœia of the United States of North America. By authority of the Medical Societies and Colleges." The convention in Washington also provided for a decennial revision and republication of this work.

Conclusive evidence is wanting as to the extent to which this first national Pharmacopœia was adopted and used. In view of the fact that the comparatively small edition of 1820 did not require a reprint before the year 1828 the demand for the book in so large a country must have been a very limited one.

The First Pharmacopœial Convention.

The convention for the first revision of the United States Pharmacopœia met in Washington in January, 1830. It was attended by eight delegates only. A draft for a revised edition of the Pharmacopœia was presented by the delegates of the Philadelphia Medical Societies and was referred to a Committee of Revision and Publication. This consisted of Drs. George B. Wood and Franklin Bache, of Philadelphia, the subsequent founders of the United States Dispensatory, and Dr. Jacob Bigelow, of Boston. They issued the revised edition in 1831 under the title, "The Pharmacopœia of the United States of America. By authority of the National Medical Convention held at Washington, 1830."

A Rival Pharmacopœia.

In the same year a secessional convention of delegates of medical societies was held in New York, which resulted in the elaboration and publication of a rival pharmacopœia, issued in 1830 under the title, "The Pharmacopœia of the United States of America. By authority of the general convention for the formation of American Pharmacopœia, held in 1830. Second edition from the first edition in 1820, with additions and corrections."

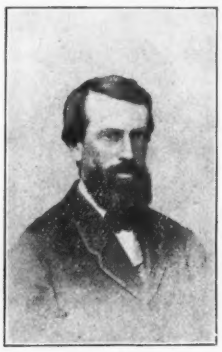
The "Philadelphia Pharmacopœia" evidently was the legitimate and recognized sequel to the one of 1820 and the precursor of the subsequent decennial editions of the United States Pharmacopœia. During the first decades and even much later the consecutive revised editions, however, seem not to have attained any wide or general use and influence, chiefly for the reason that the two principal revisers had completely superseded the Pharmacopœia by

H. C. WOOD,
First Editor of "The American Druggist;" Editor of "The U. S. Dispensatory."

publishing in 1833 their "United States Dispensatory," a comprehensive work which so fully and satisfactorily met the requirements of the medical and pharmaceutical professions in regard to materia medica as to make unnecessary any other standard or compend. This work has maintained its supremacy ever since through eighteen consecutive editions, of which the fifteenth to the eighteenth were rewritten and revised by Professors H. C. Wood, Joseph P. Remington and S. P. Sadtler, keeping steady pace with the progress of pharmacopœial evolution and the advance of the pertinent sciences and arts.

Early Dispensatories.

The prompt and unrivaled success of this work is the more signal seeing it



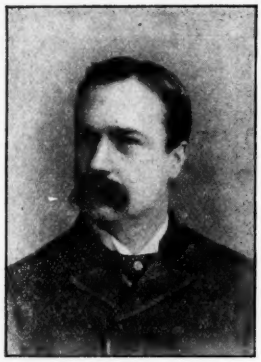
WM. PROCTER, JR.,
Editor of First Text-Book of Pharmacy (Mohr & Redwood's); from 1850 to 1871 Editor of "The American Journal of Pharmacy."

had at first to compete with earlier dispensatories. In 1806 Dr. John R. Coxe, of Philadelphia, published the "American Dispensatory," which seems to have been a well executed work, since it was reissued in eight consecutive revised editions, the last one appearing in 1831. In 1810 "The American New Dispensatory" was issued by Dr. James Thacher, of Plymouth, Mass., under the auspices of the Massachusetts Medical Society. It was revised and enlarged four times, the fourth edition appearing in 1821. In 1813 a Dispensatory mainly devoted to therapeutics was issued by Dr. Peter Smith (the Indian doctor), published in Cincinnati, being the first work of its kind issued west of the Alleghanies. In 1852 the "American Eclectic Dispensatory" was published by Professor John King, M.D., and Prof. Robert S. Newton, M.D., at Cincinnati, of which sixteen editions have appeared up to 1900, the last three revisions having been issued by Prof. H. W. Felter, M.D., and Prof. John Uri Lloyd, Phr.M., Ph.D.

The principal compeer of the United States Dispensatory, the "National Dispensatory," by Professors Alfred Stille, M.D., and John M. Maisch, was published in 1879. Four revised editions have appeared to date, the last being edited by Professors Stille and Charles Caspari, Jr., and Dr. H. C. C. Maisch.

Pharmaceutical Literature.

In causal relation to the final realization of an American Pharmacopœia and the correlated Commentaries or Dispensatories stands the nearly simultaneous rise and development of the kindred American pharmaceutical literature and the concurrent inception of associate action tending towards a more methodical and uniform education of pharmacists and a stricter discrimination in, and control of, the practice of medicine and pharmacy. For want of any State or municipal aid the establishment of col-



JOSEPH P. REMINGTON,
Editor "U. S. Dispensatory."

leges of medicine as well as of pharmacy was left to the discretion and action of the respective professors. In this way the first College of Pharmacy in the United States was commenced on a modest scale at Philadelphia in 1821 and the second at New York in 1829.

The First Drug Journal.

The sagacious men who were specially instrumental in the fundamental work of securing a progressive elevation of the status of pharmacy and for obtaining a National Pharmacopœia, soon added another potent factor for fostering proficiency and advance by the establishment of the first American pharmaceutical periodical—the "Philadelphia Journal of Pharmacy," issued in the fall of 1825.

Although some chemical and botanical text-books had been published in the United States during the first quarter of the nineteenth century, the impetus given by the Pharmacopœia, the Dispensatories and the Colleges of Pharmacy has been chiefly instrumental in the inauguration and gradual rise of a native pharmaceutical literature.

The First Text-Book of Pharmacy

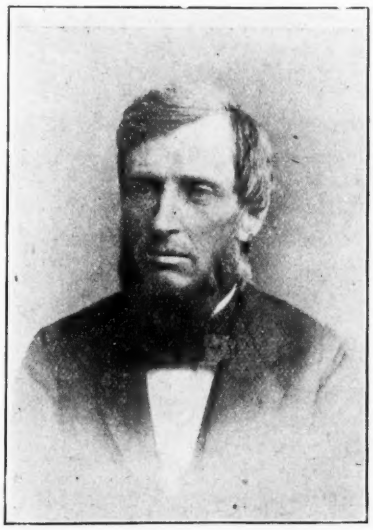
and the precursor of later compends was published by Edward Parrish, from 1864 to 1872 Professor of Materia Medica and Pharmacy in the Philadelphia College of Pharmacy. It was published in 1855 under the title, "A Treatise on Pharmacy, designed as a text-book for students and as a guide for the physician and pharmacist." With several older British compends and the text-book of Francis Mohr and Theophilus Redwood, adapted for the use of American students by William Procter, Jr., published in 1849, and with some other European text-books, Professor Parrish's book remained for about thirty years the first American compend of its kind. It was reissued in four revised editions, the last one being edited in 1884 by Thomas Wiegand, one of the few surviving and still active veteran pharmacists of the Philadephia College of Pharmacy. Commensurate with the expansion and progress of the kindred sciences, of pharmaceutical education and proficiency, quite a number of compends specially designed for the use of pharmacists appeared during the last quarter of the century, evidently meeting with increasing demand and use and superseding the older text-books.

ALBERT E. EBERT,
Editor of "The Pharmacist."

Pharmaceutical Text-Books.

The foremost and most popular handbooks of the theory and practice of pharmacy, partly reissued in revised editions in the course of years, are:

1885, "The Practice of Pharmacy," by Prof. Joseph P. Remington, Philadelphia.



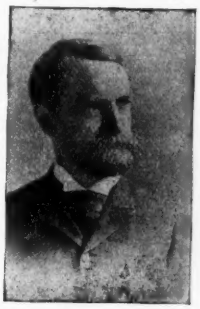
ED. PARRISH,
Author of the First American Text-Book of Pharmacy.

1887, "The Beginnings of Pharmacy," by R. Rother, Detroit, Mich.
1891, "A Course of Home Study for Pharmacists," by Prof. Oscar Oldberg, Chicago.
1894, "Handbook of Pharmacy," by Prof. Virgil Coblentz, New York.
1894, "Companion to the U. S. Pharmacopœia," by Prof. O. Oldberg and Prof. Otto Wall, Chicago and St. Louis.
1895, "A Treatise on Pharmacy," by Prof. Chas. Caspari, Jr., Baltimore.
1895, "The Art of Compounding," by Prof. W. L. Scoville, Boston.

In addition to the foregoing a number of smaller books, designed mainly as quiz-compends for students of pharmacy, have been published under various titles, like "Essentials of Pharmacy," "Syllabus of Pharmacy," "Principles of Pharmacy," etc.

Pharmaceutical Chemistry.

Up to about the middle of the century British and German text-books in the various departments of applied chemistry were used for the study of chemistry



S. P. SADTLER,
Chemical Editor "U. S. Dispensatory."

by pharmacists, among them the once well known works of Attfield, Fownes, Watts, Bloxam, Gregory, Odling, Graham and others, of Wöhler, Gmelin, Duflos, Wittstein, H. Rose, Fresenius and others. The production of American text-books and compends in the various departments of theoretical and applied chemistry has been a prolific one in recent years, quite commensurate with the progress in the methods and scope of instruction and in laboratory practice of the American universities and colleges. From among their considerable number only those may be enumerated here in the chronological order of their first appearance which were specially designed for the use of pharmaceutical and medical students:

Pharmaceutical Chemistry.

1884, "Manual of Chemistry," by Prof. Wm. Simon, M.D., Baltimore.
1886, "Textbook of Medical and Pharmaceutical Chemistry," by Prof. E. H. Bartley, M.D., Brooklyn, N. Y.
1894, "An Elementary Course in Inorganic Pharmaceutical Chemistry," by Prof. F. J. Wulling, Minneapolis.
1895, "A Textbook of Chemistry for the Use of Pharmaceutical and Medical Students," by Professors S. P. Sadtler, Ph.D., and H. Trimble, Philadelphia.

Analytical Chemistry as Applied in Pharmacy.

1873, "Manual of Chemical Analysis, as Applied to the Examination of Medicinal Chemicals," by Fr. Hoffmann, Ph.D., New York.
1877, "Qualitative Chemical Analysis," by Professors Douglas and A. B. Prescott, Ann Arbor, Mich.
1879, "First Book of Qualitative Chemis-

P. WENDOVER BEDFORD,
Editor of the "Pharmaceutical Record."

SEWARD W. WILLIAMS

Associate Editor of the "Weekly Drug News."

try," by Prof. A. B. Prescott, Ph.D., Ann Arbor, Mich.

1883, "Examination of Medicinal Chemicals," by Fr. Hoffmann, Ph.D., New York, and Prof. F. B. Power, Ph.D., Philadelphia.

1886, "Manual of Practical Assaying," by A. B. Lyons, Ph.D., Detroit, Mich.

1886, "Practical and Analytical Chemistry," by Prof. H. Trimble, Philadelphia.

1887, "Organic Analysis," by Prof. A. B. Prescott, M.D., Ann Arbor, Mich.

1889, "Lessons in Qualitative and Volumetric Chemical Analysis," by Prof. Chas. O. Curtman, M.D., St. Louis, Mo.

1890, "Uses, Tests for Purity and Preparation of Chemical Reagents," by Prof. Chas. O. Curtman, M.D., St. Louis, Mo.

1894, "Textbook of Volumetric Analysis," by Prof. H. W. Schimpf, Brooklyn, N. Y.

1899, "Hand-book of Practical Assaying of Drugs and Galenicals," by A. B. Lyons, Ph.D., Detroit, Mich.

1899, "A system of Instruction in Qualitative Chemical Analysis," by Arthur H. Elliott and G. A. Ferguson, New York.

Materia Medica and Pharmacognosy.

1847, "Manual of Adulteration," by L. C. Beck, Albany, N. Y.

1882, "Manual of Organic Materia Medica," by Prof. John M. Maisch, Philadelphia.

1887, "Handbook of Materia Medica, Pharmacy and Therapeutics," by Prof. S. O. L. Potter, M.D., San Francisco.

1894, "A Manual of Organic Materia Medica and Pharmacognosy," by Prof. L. E. Sayre Lawrence, Ks.

1896, "Manual of Materia Medica and Pharmacognosy," by Prof. D. M. R. Culbreth, M.D., Baltimore.

Botanical Works.

The number of botanical works, both text-books and compends, as well as national and sectional floras, is an abundant one, many of them being of superior value and great excellence. Specially designed for pharmacists are:

The books of the late Prof. E. S. Bastin, of Philadelphia, "Elements of Botany," published in 1887; "College Botany," published in 1889; "Laboratory Exercise in Botany," published in 1895, and the work of Professors H. Rusby and S. E. Jelliffe, New York: "Morphology and Histology of Plants," 1899.

CASWELL A. MAYO,

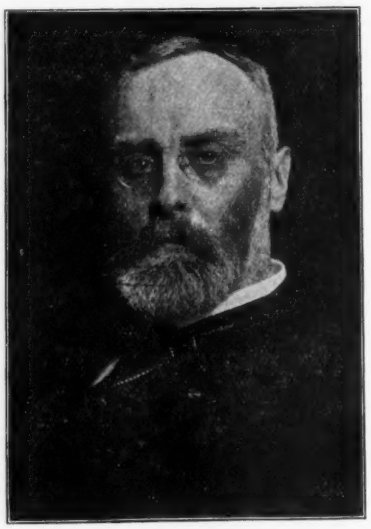
Editor of the "American Druggist and Pharmaceutical Record."

Records of the Progress of Pharmacy.

A characteristic and essential feature of American pharmaceutical literature are the annually published Proceedings of Pharmaceutical Associations, particularly of the American Pharmaceutical Association, issued since its organization in 1851. The forty-seven volumes of this national association contain, in addition to its proceedings and to an abundant series of most valuable original papers and discussions, annual reports on the progress of pharmacy which make this publication a comprehensive and most useful repository of the best thought, researches and labors of the ablest and most productive talent in American pharmacy, as well as a collective record of the progress of pharmacy during the second half of the century.

Editors of the A. Ph. A. Proceedings.

The accomplished editors of these Proceedings of the American Pharmaceutical Association have been the general secretaries of the association from 1852 to 1893, the late Prof. John M. Maisch, Philadelphia, and since then Prof. Charles Caspari, Jr., Baltimore. The compilers of the Annual Reports on the Progress of Pharmacy have been: From 1852 to 1861, Prof. C. L. Diehl, Louisville, Ky.; from 1862 to 1863, Prof. Ferd. F. Mayer, New York; from 1863 to 1864, George O. J. Scattergood; 1865 to 1867, Prof. C. L. Diehl; 1868, Dr. Fred Mahla, Chicago; 1869, Dr. Fr. Hoffmann, New York; 1870, Prof. Wm. T. Wenzell, San Francisco, Cal.; 1871, Thos. E. Jenkins, Louisville, Ky.; 1872 to 1890, Prof. C. L. Diehl; 1891, Dr. Chas. Rice, New York, and Hans M. Wilder, Philadelphia; 1892 to 1894, Prof. Henry Kraemer, Philadelphia; 1895 to 1900, Prof. C. L. Diehl, Louisville, Ky.



FREDERICK A. CASTLE,

Editor of the "American Druggist" from 1873 to 1892.

The considerable series of annual reports published by the Pharmaceutical Associations of the various States of the Union, commencing about the year 1870, also contain a large amount of original contributions to pharmaceutical knowledge and form, next to the first mentioned annual Proceedings of the National Association, an integral part of the current American pharmaceutical literature.

FRANK L. JAMES,

Editor of the "National Druggist."

Pharmaceutical Periodicals.

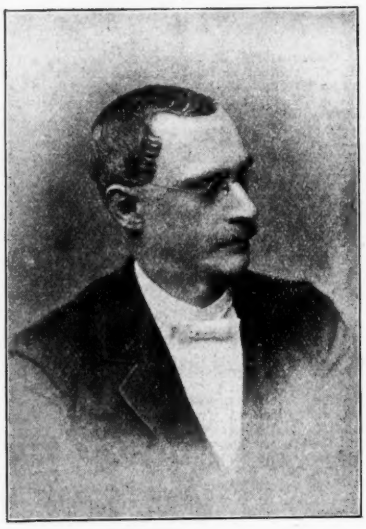
As stated above, the founders of the first College of Pharmacy soon ventured upon the experimental establishment of a pharmaceutical periodical by issuing in December, 1825, a pamphlet of thirty-two pages called "The Journal of the Philadelphia College of Pharmacy," containing reports on college affairs, on the drug market, and some original contributions. Among the pharmaceutical periodicals properly so-called this seems to have been the first published in the English language,[1] antedating all subsequent British pharmaceutical period-

[1] Early American periodicals devoted to medicine and the sciences, which also considered chemical matters, were: "The Transactions of the American Philosophical Society," first published in 1771 in Philadelphia; "The Medical Repository," commenced in 1797 by Dr. Sam. L. Mitchill in New York. To these two publications Dr. Joseph Priestley contributed his last chemical papers relating to carbonous oxides and sustaining the phlogiston theory. "The Journal of the Academy of Natural Sciences" of Philadelphia was established in 1817, and the "American Journal of Sciences and Arts," by Benjamin Silliman, in 1818.

As a branch in the curriculum of medical studies chemistry seems to have been first recognized and taught at Kings College (now Columbia University) in New York in 1767; at the University of Pennsylvania in 1768; at William and Mary College in Virginia in

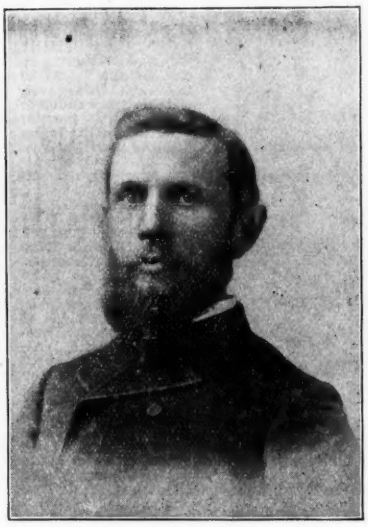
THOMAS J. KEENAN,

Associate Editor of the "American Druggist and Pharmaceutical Record."



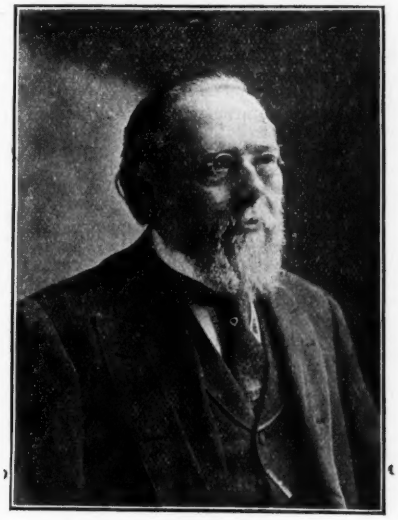
CHARLES RICE,

Former Associate Editor of the "American Druggist;" Chairman of the Committee on Revision of the U. S. Pharmacopœia.



OSCAR OLDBERG,

Editor of "The Apothecary," Author of Companion to the U. S. Pharmacopœia, etc.



C. LEWIS DIEHL,

Reporter on the Progress of Pharmacy, A. Ph. A., for Twenty-four Years.

icals,[2] while Germany had several such journals dating back to about 1780,[3] and France, 1809.[4] Subsequent numbers were issued in May, 1826, and in September and November, 1827. In 1828 Benjamin Ellis became the editor and the journal was issued oftener but quite irregularly. The fifth number, published in 1829, was marked No. 1 of the first volume, and from then to the year 1853 four numbers, forming one volume, were issued each year. From 1853 to 1871 one number was issued every other month, six numbers forming one annual volume. From 1871 the journal was made a monthly. Dr. Ellis died in 1833, and his successor in the chair of Materia Medica, Dr. R. C. Griffith, succeeded him as editor of the journal, whose title had been changed in 1835 to "American Journal of Pharmacy." After the resignation of Dr. Griffith in 1836 its editors were: Joseph Carson, M.D., from 1836 to 1850; Prof. Wm. Procter, Jr., from 1850 to 1871; Prof. John M. Maisch, from 1872 to 1893; Prof. Henry Trimble, from 1894 to 1898, and since by Prof. Henry Kraemer.

Ventures in Journalism.

The second venture with a college organ was made in 1852 by the New York College of Pharmacy, which published a periodical bearing the title, "New York Journal of Pharmacy, published monthly by authority of the College of Pharmacy of the City of New York." It appeared monthly from January, 1852, to November, 1853, under the editorship of Wm. McCready, M.D., professor of Materia Medica and Pharmacy in the College. Although ably edited the paper was discontinued at the end of the year 1853, but reappeared with one more number in December, 1854, under the title, "New York Journal of Pharmacy," edited by Thomas Antisell, M.D. The venture, however, failed and was discontinued.

Other early ventures in pharmaceutical journalism were announced from Baltimore in 1858, Chicago in 1867, and Toronto, and the titles are given in the references further on.

A most successful and for about thirty years one of the most skillfully edited of American pharmaceutical periodicals was commenced as a private enterprise at the end of 1856 by two German pharmacists, Heinrich and Carl Brugmann or Brueckmann, who came here in 1849 from Lueneburg in Northern Germany. The elder of the two brothers, Henry, born August 19, 1817, had studied medicine in Philadelphia, resided in Milwaukee from 1853 to 1854, and subsequently in New York, where he engaged with his brother in the retail drug business. At the beginning of 1857 they issued the first number of the "American Druggists' Circular and Chemical Gazette, a practical journal of Chemistry applied to Pharmacy, Arts and Sciences, and General Business Organ for druggists, chemists and apothecaries. Edited by Dr. Henry Bridgman, New York. Publishers, Bridgman & Co., Apothecaries and Druggists, 158 Grand Street, New York."

Henry appears to have been the intellectual founder of the paper, and from the third number, March, 1837, the name of Henry Bridgman alone is printed as editor and publisher, and 136 Beekman Street, New York, as the place of publication. In this old-fashioned building, located in the center of the wholesale drug trade, opposite W. H. Schieffelin's drug house, the journal had its home for about thirty-five years.

While the "American Journal of Pharmacy" from its start aimed almost exclusively at representing the scientific and professional side of pharmacy, the "Druggists' Circular" devoted in its larger space an equal consideration to the trade and commercial affairs and news concerning the drug trade. Whether the "Circular" at once met with success or not is rather difficult to ascertain; in 1858 it passed into the possession and editorship of L. Vanderveer Newton, M.D.,[5] born in 1809 in the State of New Jersey, who in the course of a few years succeeded in raising the paper to national circulation and general appreciation. Dr. Newton proved to be an adroit and successful publisher and an able and discriminating editor.

1774; at Harvard College in Cambridge, Mass., in 1782; at Nassau Hall (Princeton College, N. J.) in 1795, and at Dartmouth College, New Hampshire, in 1798.

The first special professors of chemistry who taught this science in American colleges were Dr. John Maclean of Scotland, who was appointed professor in Princeton in 1795 and who lectured subsequently in William and Mary College in Virginia; Dr. James Atchinson and Dr. James Woodhouse were lecturers in the University of Pennsylvania; Dr. Aaron Dexter gave lectures in Harvard College, and Dr. Samuel L. Mitchill in Columbia College, New York, as early as 1772, the latter being the first professor of chemistry in the United States to introduce the Lavoisierian doctrine and nomenclature, and who published in 1794 an essay on the "Nomenclature of the New Chemistry," which involved him in a friendly controversy with Dr. Priestley.

[2] "Pharmaceutical Journal and Transactions," edited by Jacob Bell, was started by the Pharmaceutical Society of Great Britain in 1841, "The Chemist and Druggist," in 1859, and its Australasian edition in 1886. "The British and Colonial Druggist" was commenced in 1885.

[3] The German pharmaceutical periodicals established before 1800 were:

1780, "Almanach oder Taschenbuch für Scheidekünstler und Apotheker." Von J. F. A. Goettling, Weimar.

1782, "Magazin für Pharmacie, Botanik und Materia Medica." Von J. H. Pfingsten, Halle a. S.

1783, "Chemisches Archiv." Von L. F. F. von Crell, Leipzig.

1784, "Chemische Annalen für die Freunde der Naturlehre, Arzneigelahrtheit, Haushaltungskunst und Manufacturen." Von Lorenz Crell, Helmstaedt und Leipzig.

1785, "Magazin für Apotheker, Chemisten und Materialisten." Von Johann Caspar Elwert, Nürnberg.

1793, "Journal der Pharmacie für Aerzte und Apotheker." Von Joh. B. Trounsdorf, Leipzig.

1796, "Berlinisches Jahrbuch der Pharmacie und für die damit verbundenen Wissenschaften." Von F. A. Gehlen und Valent. Rose, Berlin.

[4] The first French pharmaceutical periodical was the "Bulletin de Pharmacie et des sciences accessoires." Rédigé par Parmentier, C. L. Cadet, L. A. Planché, C. F. G. Boullay, I. P. Bondet et P. R. Destouches, Paris.

[5] Dr. Newton was a printer by trade and engaged as a reporter or writer for miscellaneous political and local newspapers in Princeton, N. J.; Syracuse, N. Y.; Pittsburg, Pa., etc. In 1836 he took to the study of medicine, graduated in Philadelphia in 1837, and served as a hospital surgeon for some time. After a brief stay in London, England, he practiced medicine in Portsmouth, Va., from 1846 to 1848. In 1850 he discovered a process of coating printers' type with copper and formed the Newton Copper Type Company.

After 1866 he dropped the word "American" from the title, but otherwise edited the paper in a conservative and dispassionate spirit for twenty-three years. In later years he employed skilled assistants whenever he happened to find such available. In this capacity Prof. Ferd. F. Mayer, from 1861 to 1863 lecturer in the New York College of Pharmacy; Francis E. Engelhard, later on director of the salt works at Syracuse, N. Y., and F. L. A. Creuse, formerly a retail druggist in the Sixth Avenue, New York, assisted Dr. Newton for a longer or shorter term. After his death on July 10, 1880, the "Circular" came into possession of one of his nephews and was edited for some years by F. L. A. Creuse, and subsequently by Benjamin Lillard and John H. Snively. In 1884 it passed into the control of a corporation and has gradually lost its former position among American pharmaceutical periodicals, giving way to a continuous series of new, alert journalistic ventures, started partly by individuals and partly by publishing, advertising or commercial firms.

Among the earlier American pharmaceutical periodicals the "American Journal of Pharmacy" and the "Druggists' Circular" will ever prominently stand forth as models of their kind at their time, bearing the impress of the strong personality of their respective editors, William Procter, Jr., and Vanderveer Newton, both of whom excelled in journalistic ability, conservative and generous character, love of truth and uncompromising discountenance of sophistry and empiricism.

DR. H. M. WHELPLEY,
Editor "Myers Bros.' Druggist."

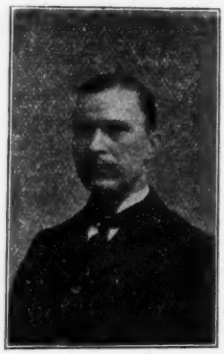
With the general development of the country and the rapid increase of its population, its commerce, industries and wealth, following the close of the war, the newspaper and periodical press of all sorts and in every domain of knowledge and application also prospered and multiplied, pharmaceutical journals forming no exception. In the following enumeration of journals founded subsequently to the establishment of the "American Journal of Pharmacy" and the "Druggists' Circular," no attempt is made to give any estimate of their respective merits or demerits. The leaders among the surviving journals are well known and their policies and methods fully understood by their readers. The journals are named in the chronological order of their publication, the years of their establishment and continuation or discontinuation being included.

Drug Journals of America.

1858-1862, "Journal and Transactions of the Maryland College of Pharmacy." Published quarterly by authority of the College. Editor, Wm. S. Thompson, Baltimore.

1860-1860, "The Druggist." A monthly newspaper for the trade. Henry E. Foote, editor, Cincinnati.

1867-1885, "Pharmacist and Chemical Record." A monthly journal devoted to pharmacy, chemistry and the collateral sciences. Published by the Chicago College of Pharmacy. Edited by N. Gray Bartlett and Albert E. Ebert. After 1869 this excellently conducted, brisk journal was edited by the able and valiant pen of Albert E. Ebert. [From Vol. III. edited by E. H. Sargent.] Its title was changed in 1874 to "The Pharmacist," and in 1879 to "The Pharmacist and Chemist, a Monthly Journal of Pharmacy, Therapeutics and Allied Sciences," published by the Chicago College of Pharmacy, edited by H. D. Barrison. From 1880 to 1881 its editor was Louis C. Hogan, from 1881 to 1883 Robert H. Cowdrey, and from 1884 to 1885 Oscar Oldberg.



CURTIS G. LLOYD,
Author of "Drugs and Medicines of North America."

1868-1900, "Canadian Pharmaceutical Journal." Published under the auspices of the Canadian Pharmaceutical Society. In 1870 this was changed to "Published by authority of the Ontario College of Pharmacy. Editor, E. B. Shuttleworth, in Toronto, monthly, and afterward to "Canadian Pharmaceutical Journal and Pharmacal Gazette." Editor, Prof. J. E. Morrison.

1870-1870, "The Southern Druggist." Published monthly for gratuitous distribution by Jesse R. Jones, Crystal Springs, Miss.

1871-1900, "Oil, Paint and Drug Reporter." Published weekly by Root & Tinker. This weekly has absorbed three periodicals started at later dates, viz.: In 1883, the "Oil, Paint and Drug Review;" in 1885, the "Weekly Drug News;" and the "American Pharmacist," consolidated with the latter journal in 1883.

1872-1884, "New Remedies," a quarterly retrospect of therapeutics, pharmacy and allied subjects. Published by William Wood & Co., New York; edited by H. C. Wood, of Philadelphia. In 1873 Fred A. Castle became editor, and in 1876 the title of the paper was changed to "New Remedies, a Monthly Trade Journal of Materia Medica, Pharmacy and Therapeutics," edited by Fred A. Castle and Charles Rice. In 1884 the title of the paper was changed to "American Druggist, an Illustrated Monthly Journal of Pharmacy, Chemistry and Materia Medica." From 1885 to 1892 the paper was issued twice each month. In 1892 it passed into the possession of Ashbell R. Elliott, under the editorship of Caswell A. Mayo. In 1893 it was consolidated with the "Pharmaceutical Record," and has appeared ever since under the title, "American Druggist and Pharmaceutical Record, a Journal of Practical Pharmacy," edited by Caswell A. Mayo and Thomas J. Keenan, New York.

1873-1875, "The Druggist." Editors, W. A. Whittlesey and G. H. Tilden, New York.

1874-1875, "The Tennessee Pharmacal Gazette." A monthly review of practical pharmacy. Edited by Benjamin Lillard, M. Stafford and Thomas Black, Nashville. During the last year of its existence the paper appeared weekly under the title, "The Pharmacal Gazette." A weekly review of practical pharmacy. Edited by Benj. Lillard, Nashville.

1873-1877, "The Laboratory." A monthly journal of the progress of chemistry, pharmacy, medicine, recreative science and the useful arts. Published by Wm. W. Bartlet, Boston. Editor, Chas. F. Babcock, Boston. In 1877 it was published under the title, "The American Laboratory." A bi-monthly journal.

1875, "Deutsch-amerikanische Pharmaceutische Zeitung." Central organ für die deutschen Apotheker, Aerzte und Droguisten in den Vereinigten Staaten. Herausgegeben von A. G. F. Streit und O. M. Huncke, Belleville, Ill. (Later Okawville).

1876-1878, "Druggists' Advertiser and Trade Journal," New York.

1878-1900, "The New Idea." A monthly journal of true pharmacy in opposition to quackery in pharmacy. Published by Fred. Stearns & Co., in Detroit.

1878-1879, "The Druggist and Chemist." A monthly review of medicine and pharmacy. Edited by C. C. Vanderbeek, Philadelphia.

1879-1888, "The Formulary." A quarterly journal of practical pharmacy for druggists and pharmacists. Being a supplement to "Fenner's Formulary." Published by B. Fenner in Westfield, N. Y.

1879-1900, "The Druggist, and Paint and Oil Review." Published by Chandler & Engelhard. Edited by G. P. Engelhard, F. M. Goodman and C. F. Morey in Chicago. After March, 1880, the title of the monthly became "The Druggist." Edited by G. P. Engelhard and E. B. Stuart. In 1882 the publishers became G. P. Engelhard & Co., Chicago. As assistant editors acted henceforth temporarily A. G. Vogeler and C. S. N. Hallberg. In 1885 the title of the monthly was changed to "The Western Druggist."

1880-1900, "St. Louis Drug Market Reporter." Monthly. Published by Meyer Brothers, St. Louis. Editors, H. M. Whelpley and C. F. G. Meyer.

1880-1883, "Oil, Paint and Drug Review." Edited by Hugo G. Adam, New York. This paper was consolidated with the "Oil, Paint and Drug Reporter," established in 1871.

1878-1885, "Drug News." Published by Root & Tinker, New York. Edited by George Bartholomew. In 1882 its title was changed to "Weekly Drug News," a technical and commercial journal devoted to drug, chemical and pharmaceutical interests. Edited by Adams and Bartholomew. In 1883 the paper was consolidated with the "American Pharmacist," established in 1882, and henceforth published under the title, "Weekly Drug News." Published and edited by John M. Peters, New York. Associate editor, Seward W. Williams. These again were amalgamated in 1885 with the "Oil, Paint and Drug Reporter," established in 1871.

1880-1900, "Deutsch-amerikanische Apotheker Zeitung." Organ für Apotheker, Aerzte, Chemiker, Droguisten, Herausgegeben von Isaac Plaut. After 1882 by Pharmaceutical Publishing Co., New York.

JOSEPH E. MORRISON,
Editor "Canadian Journal of Pharmacy."

1881-1883, "Drug World." Published monthly by Lawrence & Son, New York and St. Louis. In 1883 consolidated with "Medical Brief."

1881-1881, "The Drug Mill," a monthly journal devoted to the best interests of the pharmaceutical profession. Published by John H. Nelson, Cleveland.

1881-1893, "Martin's Chemists' and Druggists' Bulletin and Medical Advocate." Published monthly by Charles S. Martin in New York. In 1882, editor, P. W. Bedford. In 1883 the paper came into possession of its editor and was henceforth published under the title, "Pharmaceutical Record," a semi-monthly journal of pharmacy, chemistry, materia medica and allied sciences. Published and edited by P. W. Bedford." In April, 1893, it was consolidated with the "American Druggist," established in 1872, and has since appeared under the title, "American Druggist and Pharmaceutical Record." Published by American Druggist Publishing Co., and edited by Caswell A. Mayo and Thomas J. Keenan, New York.

1882-1900, "The St. Louis Druggist." Published by the Richardson Drug Company. Edited by J. L. Peters. Weekly. After 1884 published monthly by the Druggists' Publishing Co. in St. Louis. Editor, Frank L. James; in 1885, H. M. Whelpley, O. Wall and G. H. Charles Kile in 1886 to 1888. From 1888 published and edited by Frank L. James and Henry K. Strong in St. Louis under the title, "The National Druggist."

1882-1883, "American Pharmacist." Published by Wm. O. Allison. Editor, J. A. Peters, New York. In 1883 consolidated with "Weekly Drug News," established in 1880, and in 1885 with "Oil, Paint and Drug Reporter," established in 1871.

1882-1895, "The Indiana Pharmacist." A monthly journal devoted to pharmacy, chemistry and allied arts. Published and edited by Jos. R. Perry, Indianapolis.

1882-1883, "The National Druggists' Journal. Devoted to the trade." Edited by George Matteson, Cincinnati.

1882-1900, "Pharmaceutische Rundschau." Eine Monatsschrift für die wissenschaftlichen und gewerblichen Interessen der Pharmacie und verwandten Berufs, und Geschäftszweige in den Vereinigten Staaten. Herausgegeben von Fr. Hoffmann, New York. Since 1896 published in English under the title, "Pharmaceutical Review" (formerly "Pharmaceutische Rundschau"). An illustrated monthly journal published in the interests of the science and the art of pharmacy and allied

branches of medical and sanitary sciences. Edited by Frederick Hoffmann and Edward Kremers, Milwaukee, Wis.

1883-1889, "The Druggists' Journal." A monthly publication of materia medica, chemistry, botany and microscopy. Published by Geo. A. Frey & Co., Philadelphia. Editor, 1883 to 1886, L. E. Sayre; 1887 to 1889, Wm. L. Turner.

1883-1893, "The Formulary." A monthly journal of practical pharmacy. Devoted to the every-day wants and uses of American druggists. Published and edited by B. Fenner, Westfield, N. Y.

1884-1887, "Drugs and Medicines of North America." A quarterly devoted to the historical and scientific discussion of botany, pharmacy, chemistry and therapeutics of the medicinal plants of North America, their constituents, products and sophistications, by J. U. Lloyd and C. G. Lloyd, Cincinnati. An illustrated and most important contribution to American pharmacognosy.

1884-1892, "The Drugman." A monthly trade journal devoted to the interests of the drug, paint and oil trades. Published by the Drugman Co., Chattanooga, Tenn; since 1880 in Nashville, Tenn. Editors, T. B. Rains and J. C. Wharton.

1884-1885, "The Southern Pharmacist." Edited by Ferd. Lascar, New Orleans. Monthly.

1884-1900 "Drugs, Oils and Paints." Monthly. Philadelphia.

1885-1886, "Omaha Drug and Oil Gazette," Charles J. Daubach, editor. Omaha, Neb.

1885-1889, "The American Pharmacist." A monthly journal, published in the interest of retail druggists, by Chas. Wright, Detroit, Mich.

1885-1900, "Oil, Paint and Drug Review." Published by D. Van Ness Person, Chicago.

1886-1888, "The Northwestern Pharmacist." Devoted to the interest and progress of pharmacy. Minneapolis.

1886-1900, "The Western Drug Record." Published by Woodward, Faxon & Co., Kansas City, Mo. A monthly transcript of pharmacy and the drug trade.

1886-1888, "Druggists' Gazette." A monthly journal of pharmacy and the drug trade, by Hugo W C. Martin, Chicago.

1886-1888, "The Texas Druggist." In 1887 changed to "The Texas and Southwestern Druggist." Official organ of Texas State Pharmaceutical Association. Published at Waco, Tex.

1887-1900, "The Druggists' Bulletin." A monthly exponent of pharmaceutical progress and news. Published by Geo. S. Davis, Detroit. Since 1890 under the title, "Bulletin of Pharmacy." Editors, Jos. Helfman and H. B. Mason.

1887-1900, "The Pharmaceutical Era." Published by D. O. Haynes & Co. in Detroit. Edited by A. B. Lyons. Monthly. Since 1888 in New York, semi-monthly, and since 1894 weekly. Editor, Charles W. Parsons.

1887-1898, "Drug Clerks' Journal." Since 1890 "The Registered Pharmacist." A practical journal of pharmacy and collateral branches. By J. M. Eaton and L. Hogan; since 1890 by O. O. Stolz and J. M. Eaton. Monthly. Chicago.

1887-1888, "The Peoria Drug Review." Devoted to the interests of the drug, paint and oil trades. Published monthly by Colburn, Birks & Co., Peoria, Ill.

1887-1889, "Fort Worth Drug Reporter." Published by H. W. Williams & Co., Fort Worth, Tex.

1887-1900, "The Omaha Druggist." A monthly journal of pharmacy. Published by C. H. Weller and Amos Field. Editor, M. W. Ryerson, Omaha, Neb.

1887-1898, "The Pacific Record." A monthly résumé of medical and pharmaceutical progress. San Francisco.

1887-1900, "Southern Drug and Paint Review." Published monthly by Lipman Brothers, Savannah, Ga.

1888-1900, "The New England Druggist." Monthly. Editors, Wm. W. Bartlett and D. A. O'Gorman; 1894 to 1898, W. L. Scoville and D. A. O'Gorman, Boston; since 1899, publishers, New England Druggist Publishing Co., Boston.

1888-1900, "Rocky Mountain Druggist." A monthly exponent of pharmacy and the drug trade, by J. J. Riethmann & Co., Denver, Col.

1888-1900, "The Canadian Druggist." Published by Dyas & Co., Strathroy, Ont. Edited by W. Dyas. Monthly.

1888-1900, "Notes on New Remedies." A monthly journal devoted to furnishing early and reliable news of new additions to contemporary therapy. Published by Lehn & Fink, New York. Editor, F. W. Koch. From 1897 a quarterly review of progress.

1889-1900, "Drug Topics." A bi-monthly journal of current drug news and prices. Published by McKesson & Robbins, New York. Editor, E. H. Gane.

1889-1894, "Pacific Drug Review." A monthly trade paper. Published by Snell, Heitschu & Woodward, and edited by H. D. Dietrich, Portland, Ore.

1890-1897, "The Pacific Druggist." Authorized organ of the California Pharmaceutical Society and College of Pharmacy. Edited by W. M. Searby; in April, 1894, by Frank T. Green, San Francisco, Cal. Monthly. Changed to "The San Francisco and Pacific Druggist." Walter A. Taylor, editor.

1890-1900, "Montreal Pharmaceutical Journal." A monthly journal of chemistry, pharmacy and materia medica. Montreal. Editor, I. C. Patterson. After 1892 issued under the title, "Montreal Pharmaceutical Journal." Organ of the Montreal College of Pharmacy and of the Pharmaceutical Association of the Province of Quebec. Henry Miles, editor and publisher, Montreal.

1891-1899, "The Apothecary." Published quarterly by the School of Pharmacy of Northwestern University, Chicago. Editor, Oscar Oidberg.

1892-1900, "An Ephemeris of Materia Medica, Pharmacy, Therapeutics and Collateral Information." By Edward R. Squibb and Chas. F. Squibb, Brooklyn, N. Y. This valuable periodical contains exclusively the original papers of its publishers, and is issued gratuitously.

1892-1900, "Merck's Market Report and Pharmaceutical Journal." An independent monthly magazine, devoted to the professional and commercial interests of the druggist. Published by Merck & Co., New York. Editor, Theodor Weicker. Since 1896 under the title, "Merck's Report. A practical journal of pharmacy, materia medica and chemistry."

1892-1900, "Wisconsin Druggists' Exchange." Published monthly in the interest of the Wisconsin druggists, by E. B. Heimstreet, Janesville, Wis.

1892-1896, "The California Druggist." Monthly. Edited by R. A. Allen, Los Angeles.

1892-1893, "The Pharmaceutical Review." A monthly journal published under the auspices of the Maryland College of Pharmacy. Editor, Chas. Caspari, Jr., Baltimore.

1892-1900, "Alumni Report." Published monthly by the Alumni Association of the Philadelphia College of Pharmacy. Editor, Joseph England.

1893-1899, "The Graduate." A periodical magazine devoted to the advancement of pharmacy. With the reports of the Alumni Association of the Chicago College of Pharmacy.

1894-1896, "The Alumni Journal." Published monthly by the Alumni Association of the College of Pharmacy of the City of New York. Continued, 1897-1900, under the title, "The Journal of Pharmacology." Editor, Harry B. Ferguson.

1894, "Oklahoma Druggists' Review." A monthly trade paper. Publishers, C. D. Smith Drug Company, Oklahoma City, O. T.

1894-1900, "The Journal." A quarterly, published by the Alumni Association of the Cincinnati College of Pharmacy.

1895-1896, "The Mortar and Pestle." Editor, Clay W. Holmes, Elmira, N. Y.

1896, "The Buffalo Druggist."

1898-1900, "The Midland Druggist." Published by the Midland Druggist Publishing Co., Columbus, O. W. R. Ogier, editor.

1899-1900, "The Northwestern Druggist." A journal devoted to the interests of the druggists of the Northwest. Published monthly by the Chapin Publishing Co., Minneapolis, Minn.

Tendencies of the Press.

The disproportionately increasing number of pharmaceutical periodicals appears certainly to be excessive, despite the expanse of our Continent and the rapid increase of its population, commerce, trades, industries and wealth. In the prodigious development of the periodical press and the publishing industry and of their methods, as well as in the incessant strife for "the survival of the fittest," the pharmaceutical periodicals had to adjust their functions and methods to the altered conditions and to increasing sharp competition. In some respects an untoward feature among these innovations and foreign to the original aims and objects of the professional press were the modern methods of business advertisements. The introduction of advertising pages became a necessity as a subsidiary expedient for the prosperity and consequent efficiency of the journals, particularly as the subscription rates had to be reduced. One of the adverse consequences of these modern usages has been with some papers a subsequent shortage of reading pages and a decrease of their intrinsic value, a surplus of advertising pages, an excessive multiplication of competing journalistic ventures and an unfavorable reaction upon the business prosperity of the older and more conservative and less speculative journals.

Another apparently irrelevant consequence of the competitive multiplication has been the indulgence of pharmaceutical periodicals in a surplus of personal news and gossip. Notwithstanding its drawbacks, this custom has in a country of so vast an extent its redeeming features and is somewhat justified, since it serves to keep the members of a common calling, the companions of youth or collegiate days, the participants in common but distant associations, in closer personal relations, and to foster among them a stronger bond of unity as well as a generous sympathy and forbearance in the common vicissitudes of trade and the harships of life. This departure of some of the popular American pharmaceutical periodicals, odd as their indulgence in personal gossip may appear, is certainly less of a nuisance than the disgusting spectacle of ungenerous personal animadversions and controversies frequently parading in continental, particularly German, pharmaceutical papers, and the persistently bitter antagonism prevailing between the two collateral pursuits, the privileged apothecaries and the licensed druggists in Germany.

American Progress.

At the turning-point of the first to the second century of its political independence the great American commonwealth has achieved in all domains of human research, knowledge and application a wonderful development and progress. At the commencement of the century it was in arts, sciences and letters dependent almost wholly upon the old world; at its close it ranks high as a producer and donor of intellectual and material bounties, with ample promises of further achievements and progress.

American pharmacy and its practical and literary accomplishments have kept pace with their European compeers and with the general progress of applied sciences and arts. It has consolidated and maintained its professional and mercantile elements into a distinct, although dual, pursuit, until at the dawn of the twentieth century its legitimate scope and application seem to become disturbed by an undue preponderance of mercantile tendencies jeopardizing its wonted equilibrium. Notwithstanding this prevailing drift towards trade degeneration, American pharmacy has securely built its professional superstructure upon the solid foundation of approved and suitable methods of education and consequent proficiency. An unmistakable evidence of its innate strength and stability is its substantial and prolific literature and journalism produced and cultivated by its own talent and efficiency. Therefore there is every assurance that American pharmacy, its educational institutions and methods, its standard literature and journalism, will continue in the twentieth century to hold their own in the general and professional progress, no matter what vicissitudes may be in store for its trade relations in the incessant mutations of all human affairs.

BERLIN, January, 1900.

Galenical Pharmacy During the Century.

By Prof. Joseph P. Remington, Ph.M., F.C.S.,

Professor of Theory and Practice of Pharmacy in the Philadelphia College of Pharmacy; Author of Remington's "Practice of Pharmacy;" Editor "U. S. Dispensatory."

GALENICAL pharmacy, as it is known to-day, can be briefly described as the pharmacy of vegetable medicines. The remarkable man, Galen, in whose honor this branch of pharmacy is named, was born in Pergamus, in Mysia, about 130 A. D. He commenced the study of medicine in 146 A. D., and soon after became a pupil of Pelops and the philosopher Albinus. His first appearance in Rome was in 164 A. D., where he came into prominence by healing Eudemus, a celebrated peripatetic philosopher, and by his learning and extraordinary success as a physician he acquired the title of "Paradoxopœus." He soon succeeded in getting himself greatly disliked, however, by the other physicians of Rome, who combined against him, and their jealousy and envy forced him to leave the city.

Galen's Versatility.

He returned in 168 A. D. to his native city, Pergamus, and was soon called to the personal service of the Emperor, Marcus Aurelius, but his enemies pursued him relentlessly, and the Emperor was persuaded to dismiss him as a personal attendant, but still feeling attached to him, he appointed him medical guardian of his son Commodus. It was at this time of his life that he wrote most of the important works which subsequently gave him renown. He died in the year 200 in the reign of Septimius Severus.

Although the name of this wonderful man is most frequently connected with service in medicine, he possessed large intelligence and was one of the most versatile and accomplished writers of his age. Galen was a Stoic philosopher and wrote many treatises on logic, and the fourth syllogistic figure is attributed to him.

It is not surprising that such a man should leave his impress upon future generations. Possessing enormous industry, great practical knowledge, and literary fluency, and withal furnished with the anatomical, medical and philosophical knowledge of his time, he gathered the divergent and confused threads of ancient medicine and founded a system whose influence is recognized at the present time.

Galen's System of Medicine.

Galen believed that he had discovered the cause of all disease when he propounded the doctrine that the normal condition of the body depended upon the proper proportion of the four elemental conditions—hot, cold, wet and dry. Disease was caused by the undue proportion of one or the other of these elements. Galen extended his system to the use of drugs, believing that they were possessed of one or the other of the elementary qualities above mentioned, and on the principle of curing by *opposites*, the use of one or the other was indicated. In his search for remedies he greatly extended materia medica and introduced a large number of vegetable drugs. He believed that for every ill flesh is heir to there was a remedy provided by nature, and one of the highest duties of man was to discover the uses of vegetable substances in healing diseases.

Galen's Views Bitterly Opposed.

A most remarkable fact in connection with the history of Galen is that, during his life time, his views were bitterly opposed by his contemporaries, and he had the greatest number of followers two or three centuries after his death.

Paracelsus,

who was born in 1490 A. D., was one of the greatest opponents of Galenism, and he wrote numerous books advocating the use of chemical or spagyric medicines. Paracelsus was a great believer in specifics. His early training had been in metallurgy. While technically not a chemist, he worked in an empirical way to discover chemical compounds, or active principles from plants and minerals, to take the place of crude drugs, and the teachings of this man had a large influence in modifying Galenism, so that, at the present time, modern pharmacy can be said to be based upon many of the ideas originating with these two great leaders of their time.

Some idea of the character of Paracelsus may be gained by consulting his work entitled "Paragranum," where, in speaking of the contemporary physicians of his time, he tells them that "the very down of his bald pate had more knowledge than all their writers, the buckles of his shoes more learning than Galen and Avicenna, and his beard more experience than all their universities."

Paracelsus' Death.

He boasted that he had discovered a panacea which was capable of prolonging life and curing all diseases, yet this prince of empirics died a drunkard after a few hours' illness, in the forty-eighth year of his age, with a bottle of his immortal "Catholicon" in his pocket; but we must ascribe the introduction of mercury, antimony and opium largely to the teachings of this remarkable man.

Pharmacy Early in the Century.

The earlier part of the nineteenth century found pharmacy in a very unsettled and chaotic condition. The followers of Galen and Paracelsus and the lesser leaders contended for the mastery, but our early dispensatories wisely show a spirit of selection, and both the vegetable and mineral kingdoms were drawn upon, for remedies to combat disease.

Steps Toward Galenical Pharmacy.

One of the first steps toward galenical pharmacy in the early part of the century was the establishment of drug mills, where roots, barks and herbs could be reduced to powder to fit them for extraction. The pharmacist to-day can never realize the enormous amount of labor that was wasted in the attempt to comminute drugs by means of apparatus found in the shops.

First Use of Drug Mills.

Drug mills in the United States began to be used in about the year 1805, and in 1812 Charles V. Hagner established his drug mill in Philadelphia, which soon grew to larger proportions when it was discovered that drugs could be reduced to powder by means of drug mills very much more rapidly and perfectly than by the old method of using the mortar and pestle, and honest drug millers could be found.

Researches of the Boullay Brothers Give an Impetus to Galenical Pharmacy.

Galenical pharmacy received its greatest impulse, however, later on, when the Boullay Brothers, in 1833, applied the process of percolation, which had previously been used by Count Real and others, for extracting the oil of almonds and other seeds by a cumbersome hydraulic process. It is marvelous that the Boullay Brothers' researches were not developed at once in Europe, and the advantages of percolation recognized immediately.

Percolation the Star of American Pharmacy.

American pharmacy undoubtedly owes its advancement more to a development of the process of percolation than to any other cause, and the evil of conservatism, with its unwillingness to try new methods, is nowhere more strongly shown than in the practical rejection of the method of percolation for more than fifty years by Continental apothecaries.

British Conservatism.

The British Pharmacopœia of 1898 shows a greater advance in the use of percolation than any other European Pharmacopœia, but it also points to a half century of wasted energy, with enormous losses in the aggregate, due to the persistent clinging to conservative methods. How many who have become thoroughly conversant with percolation will go back to the process of maceration for even ordinary tinctures, requiring from seven to fourteen days' soaking of the drug in the menstruum, and culminating in the mess and labor attending the extraction of the marc with the extraction press?

A Solid Achievement of American Pharmacy.

Fluid extracts would never have been evolved had it not been for percolation, and this class of concentrated preparations originating in America will always remain as among the most solid achievements of American pharmacy. The labors of Procter, Graham and Squibb (particularly from 1845 to 1875) and the freedom with which they gave the results of their researches to their pharmaceutical brethren, greatly influenced the elevation of pharmacy into a profession.

The Pharmacopoeia of 1850

contained fifteen fluid extracts, and but four of these bore any resemblance to what we now call fluid extracts; two of them, fluid extracts of cubeb and black pepper, were oleo-resins; sarsaparilla was not made by percolation and was little more than a concentrated syrup; rhubarb, pinkroot and senna,

with valerian, bore more resemblance to our present fluid extracts and were made by percolation.

As might be expected in these Pharmacopœias, alternative processes were given for the tinctures—maceration for the first process, and percolation for the alternative. The Pharmacopœia of 1850 showed a marked development in the process of percolation, and in the preface the following statement is found: "Extended application has been made of the process of percolation or displacement as an improved mode of extracting the soluble parts of medicines, and more ample directions than have heretofore been given are laid down in the Preliminary Notices for conducting it with success." In many instances percolation has been substituted for maceration, and whenever elective processes allowed, that by percolation was given first to indicate that it should be preferred.

Increasing Use of Percolation.

Twenty-five fluid extracts appear in the Pharmacopœia of 1860, and subsequent Pharmacopœias show a continual addition to the number. It is likely that the next edition will show still further advancement. It cannot be supposed that the advantages of percolation, however, are by any means confined to fluid extracts. Extracts, tinctures, oleo-resins, and even infusions are made successfully by this process.

The Introduction of Repercolation.

If percolation marked a distinct advance, re-percolation added more; this is the process which was developed by Dr. Squibb, and which had for its main purpose the saving of alcohol, and this and the absence of heat during the process, with its dissociating and destructive tendencies, has made repercolation the best improvement in the making of fluid extracts that has ever been devised.

Influence of Alcohol on Pharmaceutical Development.

The use of alcohol as a solvent and preservative has had an enormous influence upon galenical pharmacy. In fact, it can be said that all departments of pharmacy have felt its influence. Whilst water is generally termed the "universal solvent," its limitations in pharmacy have always been recognized, and liquid preparations have lacked the prime requisite of permanence. A moment's reflection will show that a vast amount of labor is saved the apothecary by the use of alcohol. The array of tinctures, fluid extracts, spirits and other alcoholic preparations which fill the greater number of the shop bottles in the modern pharmacy is evidence of this fact.

Superiority of Alcoholic Preparations of Drugs.

How many prescriptions are quickly compounded by the use of these permanent preparations, and one can easily imagine the time and labor which would be lost if they were to be replaced by infusions, tinctures and aqueous preparations which had to be made extemporaneously every time a galenical liquid preparation was desired by the prescriber. This is, of course, leaving out of consideration the tremendous disadvantages of the increased dose of an infusion or decoction in order to get the corresponding effect.

A Study of European Prescription Files

shows that infusions and decoctions are used much more largely abroad than in this country; and a careful study of the whole subject would probably show that European pharmacy would be greatly improved if fluid extracts and concentrated alcoholic preparations were more frequently employed; while in America it is obvious that in many cases infusions and decoctions could be frequently used, particularly where a diuretic or diaphoretic action is desired. In some cases, particularly in weak tonic tinctures and elixirs, the presence of alcohol is harmful on account of its liability to establish the alcohol habit. This consideration has become of late years one which can no longer be safely ignored, and a careful physician never loses sight of it; nearly every drug store in the land is forced to recognize the "alcohol fiend," who drinks elixirs, medicated wines, tonic tinctures, and even cologne water.

Revival of the Use of Acetic Acid as a Solvent for Vegetable Drugs.

The enormous internal revenue tax upon alcohol compelled pharmacists to seek a less expensive solvent and preservative, and largely through the efforts of Dr. Charles F. Squibb the use of acetic acid has been "revived." This word is used advisedly, for it must be remembered that the use of vinegar as a solvent and preservative in galenical preparations is of most ancient origin.

Introduction of Acetic Extracts.

Acetic acid as a menstruum will probably come into limited use, and there is no question that a great saving in alcohol can be effected through its adoption. This will create a new era in the use of galenical pharmacy, and it is quite probable that a class of preparations made with acetic acid will be successfully introduced.

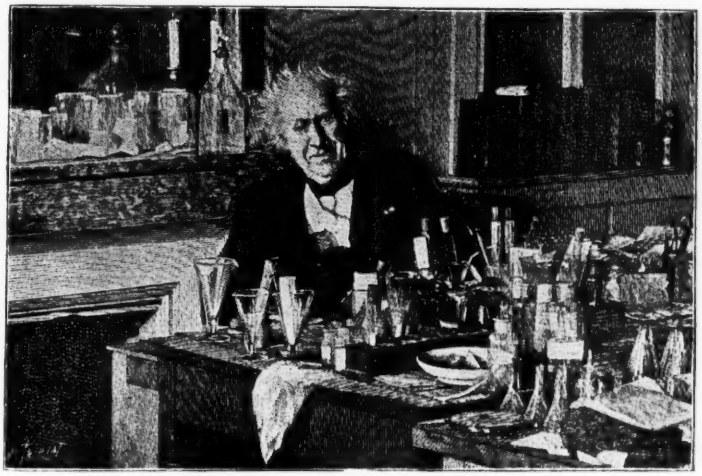
Michel Eugene Chevreul.

This sketch would be incomplete without mentioning another solvent which has had a great influence upon galenicals. That remarkable old chemist, Michel Eugène Chevreul, little dreamed when he made his classic researches on the constitution of fats, in 1823, that the by-product, glycerin, would ever come to be such an enormous factor in our civilization.

It is entirely out of the scope of this paper to dwell upon the enormous production of glycerin in the manufacture of high explosives and its uses in the arts, but in galenical pharmacy it has played a most important part, particularly in the extraction of drugs which contain tannin or allied principles.

Glycerin the Open Sesame.

The use of glycerin proved the open sesame to the difficult pharmacy of the cinchonas, as shown by the study of the formulas for the fluid extract of the cinchona; its usefulness was pointed out by A. B. Taylor and very thoroughly by Dr. E. R. Squibb. It is true that American pharmacists pushed the idea too far, and used glycerin in nearly every liquid galenical, and evidence of this can be seen in the Pharmacopœia of 1870, where 72 per cent. of the fluid extracts contain glycerin, whilst only 17 per cent. of the fluid extracts of the Pharmacopœia of 1890 contain glycerin.



CHEVREUL AT THE AGE OF 100 YEARS.

Glycerin and "Pharmaceutical Dirt."

It was found by experience that glycerin, like an over-zealous friend, went too far as a solvent, taking up many inert principles, and loading the preparation with what Professor Lloyd calls "pharmaceutical dirt," so that subsequent researches proved that the use of glycerin should be limited mainly to extracting those drugs which contain tannin and allied principles. The use of glycerin, however, extended in time to other classes of preparations, and it would indeed be a great loss if, for any reason, we should be deprived of this valuable solvent.

The Development of Manufacturing Pharmacy in America

has been one of the most interesting things in connection with the history of galenical pharmacy. In the early part of the century the wholesale drug business was largely confined to the selling of crude drugs and chemicals and to the manufacture of a few galenical specialties. The discovery of percolation and the introduction of fluid extracts soon led to the establishment of what are known as the manufacturing pharmaceutical laboratories, and, as is well known, these have grown to enormous proportions. The facilities afforded by large laboratories and the introduction of steam as a source of heat were prominent factors in this development.

"Home Made" Fluid Extracts.

The retail druggist could make fluid extracts for his own sales, and, in fact, has always been in this position, but it must be recognized by all that the advantage of buying drugs in large quantities, of conducting percolating operations on an immense scale, and, of late years, the introduction of assayed processes which enables the manufacturer to standardize his products, and at least make them uniform as far as he is concerned, have largely supplanted what might be termed the "home made" fluid extracts. That this condition has been somewhat unfortunate in taking away from the retail pharmacist not only the profit which comes from his preparations, but in diminishing his responsibility, and in a measure lowering the tone, professional character and individuality of retail pharmacy, must be admitted.

The Pharmacist Can Still Make His Own Preparations.

The possession of a large steam boiler in the laboratory, with jacketed steam kettles, stills for the recovery of alcohol, drying rooms for desiccation and evaporation, give a great advantage to the manufacturer on a large scale, and these have proved important factors in gradually, but surely, limiting the field of manufacturing for the retailer. Evidences are not wanting, however, to show that, notwithstanding these drawbacks, the retail pharmacist can still manufacture fluid extracts and many preparations with advantage pecuniarily and professionally.

One Great Incentive

to making his own preparations is the fact that he can select crude drugs himself, use the official processes, can guarantee to his customer the personal integrity of the preparations, and can conduct the operations under his own supervision at times when he is not employed in compounding prescriptions, or attending to his dispensing counter. In addition to this, he acquired a better professional standing among the physicians of his neighborhood by being something more than a purveyor of manufacturers' goods.

Steam Heat in Manufacturing.

With the advent of steam in manufacturing pharmacy came the realization that, although a method of controlling and regulating heat had been discovered, it was possible to injure solutions of vegetable principles by the use of steam during the process of evaporation and concentration. It was early shown that the active principles of many drugs were found to exist naturally in such unstable combinations that even steam heat would dissociate or decompose them.

Introduction of the Vacuum Pan.

The process of repercolation already mentioned, by doing away with the necessity of evaporating the weaker percolates in the manufacture of fluid extracts, led the way to a great improvement in this class of preparations, and in addition saved much labor and loss of alcohol. But the disadvantages in repercolation of storing the weak percolates for use in subsequent operations led some manufacturing pharmacists to adopt vacuum evaporation, and every well appointed large pharmaceutical laboratory now has its vacuum pans. These permit of evaportion of many liquids at temperatures which are so low that the dangers of dissociation and decomposition are practically *nil*, and this again gives a great advantage to the large manufacturer and takes away from the retail druggist another opportunity of making successfully some pharmaceutical preparations.

Gains of the Century.

In reviewing the history of galenical pharmacy for the last century it may be stated that in no previous century has there been such a marked advance as during the last, for whilst one hundred years ago America was forced to be contented with very moderate attainments in the manufacture of galenicals, and there were no important manuacturing centers for making this class of preparations on a large scale, at the present time hundreds of laboratories are to be found scattered all over the country, and the capital necessary to conduct them is represented by millions of dollars.

The products of American pharmacy are found not only in all parts of the Western continent, but scarcely an important town in Europe can be visited without the traveler seeing specimens of American pharmaceutical skill. It is no less true that the field is open and labor-saving apparatus in processes which are fitted for the use of the retail pharmacist have also greatly multiplied.

With the improved conditions which are now fast developing, many pharmacists are awakening to the fact that it pays professionally and pecuniarily for every one to make as many of his own preparations as he possibly can. With advancement in both directions, it would be difficult indeed to predict the condition of galenical pharmacy during the century upon which we are entering.

PHILADELPHIA, March 17, 1900.

History of the Microscope and Its Use in Pharmacy.

BY ALBERT SCHNEIDER, M.D., PH.D.,

Professor of Botany, Pharmacognosy and Materia Medica in the Northwestern University School of Pharmacy, Chicago, Ill.

THE progress in histological investigation, animal as well as vegetable, has kept pace with the progress in the manufacture of lenses for simple and compound microscopes. In other words, histology had its birth with the discovery of the microscope and has become perfected in direct ratio with the improvements in the artificial aids to vision.

The microscope in its earliest and simplest form consisted of a convex lens of some transparent substance (magnifying lenses were known long before the discovery of glass). The wise Seneca (first century), who was apparently well versed in the properties of lenses, states that the ancients noticed that writing viewed through glass globes filled with water appeared magnified, but this phenomenon was attributed to the water, which leads to the conclusion that glass lenses were unknown even after glass was in use.

The First Simple Microscope

of which there is any authentic record was made during 1300 and was known as *vitrum pulicarium* (flea glass). It consisted of a short cylindrical tube, at the upper end of which the lens was placed. The lower end carried two pieces of glass, just in focus between which the object was held. The object to be inspected or marveled at was usually a flea, hence the name. The so called "seed microscope" was similarly constructed. The sides of the tube were open for the admission of light and the two glass plates at the lower end contained small seeds. These first simple microscopes were mere toys, and no scientific use was made of them.

It was not until about the year 1650 that scientists began to make use of the simple microscope in their investigations. Their possible value in scientific investigations being recognized, special efforts were made to increase the magnifying power of the instruments as well as their definition.

Peré della Torre, of Naples (1776), and Lebaillif made excellent glass globules with very high magnifying power. Ch. Chevalier in his treatise on the microscope describes the conditions and requirements for making good magnifying globules. He insists that the globules must have a perfectly spherical form, that the glass must be pure and entirely free from air bubbles.

The Dutch scientist, Anton van Leeu-

AUTHOR'S NOTE.—The drawings accompanying this paper were copied from the work on "The Microscope," by Dr. Henri van Heurck, for which privilege kind permission was granted by the librarian of the Crerar Library of Chicago. The drawings are somewhat more diagrammatic than the originals in the work cited, but are in other respects closely similar. The illustrations were chosen with a view to illustrating the mechanism of a few types of the oldest simple and compound microscopes. I also take this opportunity to acknowledge my indebtedness to the editor of the "American Druggist," who forwarded to me a paper on the introduction of the microscope in pharmacy by Dr. Fr. Hoffmann, of Berlin.

wenhoek, used highly perfected lenses with mechanical conveniences for focussing the object under examination. In 1677 he discovered a large number of fresh water animalculæ as rotifers, vorticellæ, etc. In 1673 he discovered the red blood corpuscles, which, he said, measured $^1/_{1940}$ of an inch. The diameter, as determined by the most perfect modern instruments, is $^1/_{3200}$ of an inch; the difference being due to the spherical aberration of these early magnifiers—a source of error then not fully understood. Stellati, the Italian scientist, employed excellent lenses in his study of the anatomy of the bee (1685).

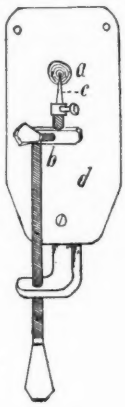


FIG. 1.

LEEUWENHOEK'S SIMPLE MICROSCOPE (1670).

a, lens; *b*, adjustment; *c*, object-holder; *d*, metal plate.

In 1740 Wilson improved the effectiveness and convenience of the simple microscope by supplying a stationary stand with foot and an adjustable mirror for illuminating by transmitted light.

About the year 1800 the number of forms of simple microscopes was multitudinous and they were about as highly perfected as they are at the present day. Spherical and chromatic aberrations were in a large measure corrected by employing combinations of lenses, as in modern simple microscopes. Cuff made a simple microscope which was capable of being converted into a compound microscope.

The First Compound Microscope

was made in 1590 by Z. Janssen, a spectacle maker of Middleburg, Holland. The exact construction of this instrument is apparently not known. It is said to have been an imposing affair, consisting of a copper tube 6 feet long, with three lenses mounted upon brass dolphins. Janssen made several instruments, one of which is still preserved at Middleburg and of which Fig. 3 is a diagram. These microscopes were of no practical value, because the image was greatly distorted and discolored. They were looked upon as curiosities rather than instruments of scientific precision.

Even as late as 1821 such eminent authorities as M. Biot, of France, and Dr. Wollaston, of England, declared that "the compound microscope will never excel the simple one."

The Oldest Example.

According to Van Heurck, the oldest compound microscope of which there is any figure is that of R. Hooke (1665). It is evident that the size of the microscopes was greatly reduced about this time, the tube in the Hooke instrument being only about 18 centimetres (7 inches) in length; there were, however, four tubes sliding into each other capable of being drawn out to increase magnification. The field lens (middle lens) was removable. Illumination was vertical by means of a lamp, spherical and bull's-eye condensers. In spite of its complex mechanism it was far from being a satisfactory instrument.

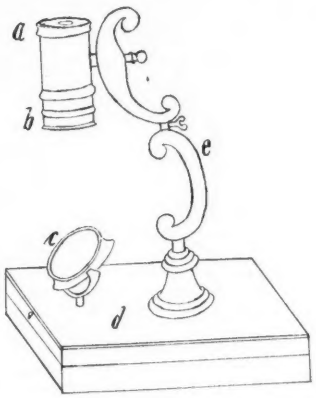


FIG. 2.

WILSON'S SIMPLE MICROSCOPE (1740).

a, lens; *b*, glass discs for holding objects; *c*, adjustable mirror; *d*, foot or base; *e*, stand.

Grindelin (1687) made a compound microscope which showed considerable improvement. Chromatic and spherical aberration were in part corrected by the use of combinations of lenses. The field lenses were more generally used. While the arrangement of lenses in this instrument indicates considerable progress, the mechanical parts were defective. There were neither condensers nor adjustable mirror. Cuff's microscope, which was patented in 1714, was provided with a movable stage capable of receiving various attachments, a mirror capable of being set in any direction, and a bull's-eye condenser. Dellabarre's microscope was, doubtless, superior to the preceding and more complete in its construction. The ocular was composed of six lenses, the objective of three lenses, a plano-concave adjustable mirror and a substage condenser. Dellabarre claimed achromatism for his microscopes, but that was, perhaps, only partially true. Later he reduced the number of lenses employed. Fig. 5 shows the mechanical parts, excepting the foot or base. A point worthy of note is that as the simple and compound microscopes increased in scientific value plainness of construction superseded the evidences of decorative fancies. Scrolls, conventional designs, etc., were omitted, and the mechanical construction was more effectually suited to the optical requirements. During the last half of the eighteenth century some very ornamental instruments were made, of which Martin's (1780) compound microscope was a good example; but in spite of their highly artistic finish they were, as a rule, very defective optically.

The highest magnification of the simple microscope possible with a maximum correction of spherical and chromatic aberration was not sufficient to enable scientists to carry on efficient histological investigations. The compound microscopes in use up to 1800 or perhaps 1825, were in reality inferior to the simple microscopes. It is true they gave a higher amplification, but this apparent gain was more than neutralized by an increase in distortion and a decrease in clearness of image due to chromatic and spherical aberration.

First Perfected Instruments.

The real improvement in compound microscopes began with the preparation of corrected lenses, about 1825, and has steadily progressed until we now have instruments with approximately corrected oculars and objectives giving a magnification ranging from 50 to 1200 diameters. Clearness of field and definition have been improved by the use of perfected mirrors, substage condensers and high power immersion lenses. It would be an endless task to consider the construction and improvements of the lenses and mechanical parts of modern compound microscopes. Those interested may consult the latest works on microscopy and on micro-technique, the catalogues of manufacturers and dealers of microscopes and microscopical supplies.

Use of the Microscope in Pharmacy.

The effective compound microscopes have been in use for nearly seventy-five years, but they have not been extensively employed by the pharmacist for more than about thirty years. This is all the more remarkable when it is now universally admitted that the compound microscope is an indispensable accessory to the equipment of the student of pharmacy as well as to the practicing pharmacist. The explanation is, doubtless, to be found in the fact that pharmacy as an independent science is of very recent origin. In the United States it is only within a few years that the courses of instruction in colleges of pharmacy have been based upon scientific principles, especially in the department of botany, with its various subdivisions, as vegetable materia medica, vegetable pharmacography and powdered vegetable drugs. The scientific study of these various branches of botany makes the use of the simple and compound microscope absolutely necessary. It is, therefore, to be regretted that there are a number of so called colleges of pharmacy that graduate students who have never used a compound microscope and who are, therefore, wholly unfit for the duties of a modern pharmacist.

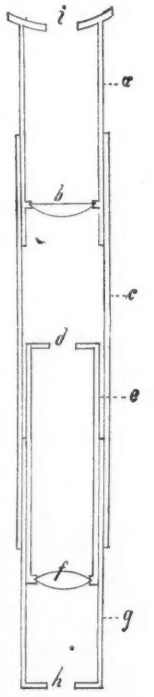


FIG 3.

JANSSEN'S COMPOUND MICROSCOPE (1590).

a, ocular tube; *b*, ocular lens; *c*, outer tube; *d*, diaphragm; *e*, middle sliding tube; *f*, objective lens; *g*, lower sliding tube; *h*, diaphragm; *i*, eye diaphragm.

Early American Work.

In America, Dr. Frederick Hoffmann was, perhaps, among the very first to

advocate the use of the compound microscope in the examination of vegetable drugs and their adulterants.* Other authorities have risen sporadically to recommend the use of this instrument. The important American work in the study of vegetable drugs did not, however begin until many years after the work was begun in Germany and France. Berg's excellent Atlas illustrating the histology of drugs was published in 1865, and even at the present time no English or American author has produced anything equal to it in importance.

The late Dr. Edson Bastin was among the first Americans to place pharmaceutical botany upon a more scientific basis, and he did much in a quiet way to encourage work in the histological study of vegetable drugs. He was a very thorough and conscientious worker.

Work of the Past Decade.

Since 1880 there has arisen a large number of American investigators, who are doing energetic work in the critical study of vegetable drugs. Of these we can mention only a few. Sayre and Dohme have done a large amount of work for a number of years. Most of their investigations have been on the histology of vegetable drugs, and the results have been published in the "Druggists' Circular" and the "American Journal of Pharmacy" and other publications. Most of the papers are accompanied by illustrations from pen and ink drawings, which are as a rule poor and hardly in accordance with the merits of the work done. There are a number of investigators who have done very excellent occasional work in the study of vegetable drugs. Of these we may mention Schlotterbeck, van Zwalu-wenberg, Denniston, Grace Cooley, Nelson, Breithaupt, and others.

Within recent years several American investigators have devoted special attention to the histological characteristics of powdered vegetable drugs and their adulterants, but here again we must admit that the investigators of continental Europe are a long way in the lead. Of these investigators Dr. Smith Ely Jelliffe, of New York, and Dr. Henry Kraemer, of Philadelphia, respectively, deserve special mention for their painstaking and original work.

Praise for Research Committee "C."

In speaking of the recent American work on the histology of crude and powdered drugs we must not forget the influence exerted by the Research Committee "C" of the Committee on Revision of the United States Pharmacopœia, of which Dr. H. H. Rusby, of New York, is the chairman. This committee selected a number of investigators of recognized ability and gave them financial and moral support in the investigation of specially assigned histological studies of vegetable drugs. Most of the best work of recent years has been done under the auspices of this committee, and it is hoped that the good work, so well begun, may be continued. It has accomplished some very important results with reference to the special histology of drugs and the detection of adulterants, and also has proven a very important educational factor, hastening the time when American pharmacists may set the initiative in the original investigation of vegetable drugs and their adulterants.

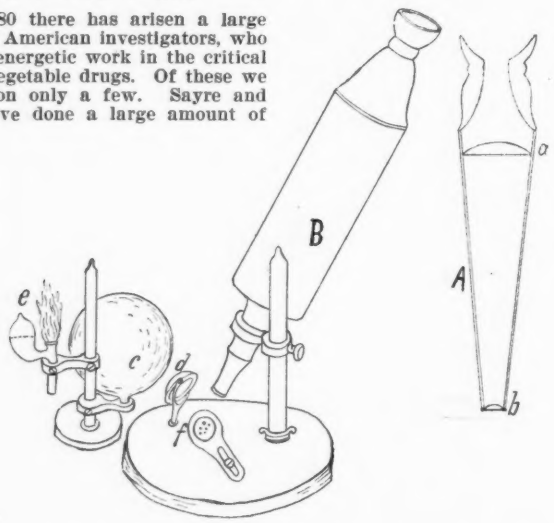


FIG. 4. HOOKE'S COMPOUND MICROSCOPE (1665).

A, diaphragm of tube, showing eye-lens at *a* and objective lens at *b*; *B*, body or tube of instrument; *c*, spherical condenser; *d*, bull's-eye condenser; *e*, lamp; *f*, stage.

Some Results from Use of Microscope in Pharmacy.

Let us consider very briefly the general results which have followed the use of the microscope in pharmacy. First of all it has caused a very marked reduction in the adulteration of vegetable drugs, of powdered drugs in particular. A properly trained and equipped modern pharmacist can detect the sophistication of powdered drugs, of ground spices and of crude drugs without any difficulty. Sophisticators have gradually been forced to recognize this fact, and, as a result, they have in many instances ceased their nefarious business, and in other instances they have met the trained scientist with almost equal shrewdness. The customary procedure of the former unscrupulous collectors, dealers, etc., was to adulterate crude drugs and powdered drugs with substances which were common, easily obtained, and which did not materially modify the gross characters of the drug. These substances were often added in large quantities and yet may have borne no histological resemblance to the drug itself. All kinds of vegetable tissues, starch and flour in particular, were used, also sand and clay, often colored artificially so as not to modify the normal color of the drug. History records the preparation of wooden nutmegs, clay coffee beans, cloves of pressed starch, etc. The wise modern sophisticator discards such crude methods; he rejects the once popular use of starches, corn meal flour and wheat flour because these substances are very readily detected microscopically. If any of the starchy substances are employed, rice starch or a similar substance is preferred, because the granules are small and would not readily be distinguished from the smaller granules of the drug itself. He is also careful not to add starch to a powdered drug which is normally free from starch, nor does he add it in large quantities. If a vegetable substance is added, tissues and organs of plants closely related to the drug are chosen, because they usually have similar histological characters and would, therefore, not be recognized so readily. Sand is, no doubt, frequently added to such powdered drugs as normally contain a little sand, as barks, leaves, herbs and flowers.

The use of the microscope in pharmacy has greatly developed the more exact knowledge of the histology of plants. Minutiæ of histological structure are now recognized which escaped the notice of earlier investigators. Our knowledge of cell contents and their distribution in the different tissues and plant organs has become much more accurate.

The student of pharmacy should have a thorough knowledge of vegetable physiology, gross morphology and histology in order that he may recognize the normal histological characters of plants used in medicine. This, coupled with a fairly good knowledge of microscopy, micro-technique and the use of micro-chemical reagents will make it possible for the practicing pharmacist to recognize the adulteration of crude drugs and powdered drugs.

Important Works on Histology of Vegetable Drugs.

In order that American and English pharmacists may readily determine the difference between their work in vegetable pharmacognosy and the work done in Germany and France, I shall cite a few references to published works which are wholly distinctive and far superior to anything yet produced either in England or America.

Berg, "Anatomischer Atlas," 1865.
This book contains excellent full-page illustrations of the histology of the more important vegetable drugs of the German Pharmacopœia. Considering the date of its production it is a remarkable work.

Collin, "Guide pratique pour la determination des poudres officinales," 1893.
An excellent little work illustrating the histological characteristics of the powdered vegetable drugs of the French Pharmacopœia. The drawings are somewhat crude but quite accurate.

Moeller, "Anatomischer Atlas," 1892.
A large royal octavo volume with full-page illustrations of the histological characteristics of the more important powdered vegetable drugs of the German Pharmaco-

* "American Journal of Pharmacy," 25: 45, 1853.

pœia. The illustrations are very fine and greatly superior to those of Collin's work.

Planchon et Collin, "Traite des drogues simples d'origine vegetales" (2 vols.), 1896.

Two large octavo volumes treating of the histology and commerce of vegetable drugs and related plants. The most complete work of its kind and profusely illustrated.

Tschirch und Oesterle, "Anatomischer Atlas der Pharmakognosie und Nahrungs mittelkunde." Serial beginning 1893.

This work treats of the complete histology of vegetable drugs and related substances. The illustrations are excellent and the subjects are comprehensively treated.

Vogl, "Pharmakognosie," 1892.

This work describes the histology of the vegetable drugs used in Austria. The histological descriptions are very accurate and complete. Only a comparatively few of the drugs are illustrated.

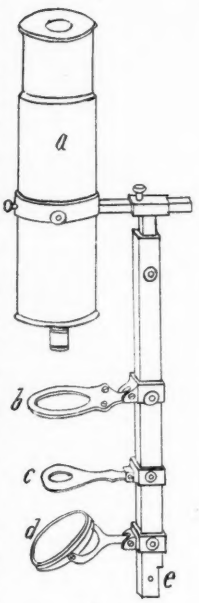


FIG. 5.

DELLABARRE'S COMPOUND MICROSCOPE (1778).

a, body or tube; *b*, stage, adjustable; *c*, substage condenser; *d*, mirror; *e*, attachment to base or tripod.

Of the American text books on vegetable pharmacognosy only a few deserve mention as being of any special value from the histological point of view. The work of Maisch contains illustrations of the histology of many of the vegetable drugs, but they are mostly diagrams of low magnification (2 to 15 diameters) and, hence, of little value in the recognition of tissue elements. This author has also introduced micro-photographic reproductions of sections of vegetable drugs, but without any success. The descriptions of the histology of drugs are not sufficiently complete and in many instances are entirely omitted. Sayre, in his text book, has followed a similar plan to Maisch's; the histological characters of the drugs are represented more highly magnified, but the illustrations are very poor.

A Good American Work Needed.

There is a demand for an American text book on pharmacognosy illustrating the histology of officinal vegetable drugs, and we hope some investigator will rise to the occasion and produce it within another year or two. Such a text book would simplify the work of teachers and students of pharmacy and would be instrumental in placing the work done by American pharmaceutical vegetable histologists on a par with the work done by the histologists of Continental Europe. That such work is possible and probably to be realized soon is evidenced by a statement made by Dr. H. H. Rusby at the Put-in-Bay meeting of the A. Ph. A. (1899), who, in referring to several papers read at the meetings of the Scientific Section, said, "We are no longer borrowing from foreigners, but do our own work."

[The hope expressed by the author that an American work treating adequately of the pharmacognosy and histology of officinal vegetable drugs will soon appear, is, we have reason to believe, likely to be realized in the near future.—EDITOR.]

Progress in the Study of the Chemistry of Volatile Oils.

BY PROF. EDWARD KREMERS, PH.D.,
Madison, Wis.

TO present an account of the progress made in the study of the chemical composition of volatile oils during the past hundred years is practically the equivalent of writing a complete chemical history of the subject. A moment's reflection will readily reveal the correctness of this statement. Organic chemistry is essentially a science of this century. Moreover, many of the compounds found in volatile oils are derivations of series of hydrocarbons which occupy an intermediate position between the paraffin series and the benzene series, a large field that has been cultivated only within recent years. At a memorial meeting held last November in honor of Ferdinand Tiemann, the discoverer of ionone, Emil Fischer, Professor of Chemistry at the University of Berlin, made the following remark:

> "No chapter of organic chemistry has been cultivated so sedulously during the last decade and by as many excellent chemists as the terpene group. In no other group have the structural formulas, which reflect the chemical knowledge of compounds, changed as rapidly and as often. So many problems are still in the process of solution that it is difficult for one not initiated to form a clear conception of the present status of the subject."

Yet in spite of this unparalleled progress it must be said that the chemistry of volatile oils is still in its initial stages. The work of the past fifteen years has widened the horizon to such an extent that we now recognize merely as an initial step what was formerly regarded as an exhaustive exposition.

An Attractive Study.

The chemistry of volatile oils had been apparently an attractive subject long before Wallach began his epoch-making researches. If we look backward, we find the names of Dumas and Berthelot in France; of Gladstone and Tilden in England; of Liebig, Wöhler, Hofmann and others in Germany, associated with the literature on the subject. Indeed, we tread on classic ground, for the researches on bitter almond oil by Liebig and Wöhler will always be regarded as one of the classical investigations of organic chemistry. The physical chemist, also, will find that some of the most important discoveries on the subject of the optical activity of carbon compounds were made on volatile oils and their constituents.

The number of observations made before this century are not many. The principal ones are those pertaining to substances that crystallized out of oils either at ordinary temperature—e.g., camphor and the stearoptene of oil of rose, or upon cooling—e.g., menthol from peppermint oil. The first elementary analysis of a volatile oil was made by Houton Labillardier in 1794. He found that turpentine oil had the composition corresponding to our modern formula $C_{10}H_{16}$. Dumas, in 1833, analyzed a number of stearoptenes from volatile oils. This was the first larger chemical contribution of prime importance on the subject. Other important contributions followed: (1) Those by Liebig and Wöhler on bitter almond oil in 1837; (2) the investigations of the hydrohalogens in the terpenes by Blanchet and Sell in 1833; by Dumas and others during 1833-1835; by Soubeiran and Capitanie in 1840; (3) the study of the dehydration products of terpin by Deville, Berthelot, Oppenheim and others; (4) the researches on the mustard oils by Will in 1844, later by Will and Körner, and by others; (5) the attempts at a classification of the terpenes by Berthelot in 1862, by Gladstone in 1864 and by Tilden in 1875; (6) the discovery of the NOCl addition products of pinene and liminene by Tilden in 1875.

Early Work Spasmodic in Character.

This entire period has one common characteristic. The attempts of all of these investigators were spasmodic. Other fields of organic chemistry proved more productive and were, therefore, more alluring. It was not until Wallach, the messiah of the terpenes, as he has been called by the late Professor Flückiger, began his investigations in 1884, that a persistent effort was made to bring order into the chaotic condition existing even then. The number of his larger contributions on this subject now exceeds fifty. Since then many others have successfully cultivated this field, notably among them Baeyer, Semmler, Tiemann and the chemists of Schimmel & Co. Among the students of Wallach who have independently continued their investigations should be mentioned Gildemeister, Walbaum and Hesse. The number of chemists in all countries at present engaged upon the study of volatile oils is by no means small. Many of them are doing excellent work, but space would hardly allow the enumeration of their names.

Rather than to give a chronological account of the investigations of these chemists, it may be of greater value to present in brief outline the advancement made under the following subjects:

(1) Definition of volatile oils.
(2) Classification of volatile oils and their constituents.
(3) Nomenclature.
(4) Influence of methods of preparation on composition
(5) Chemistry of constituents.
(6) Chemical examination (including assay) of volatile oils.
(7) Literature.

Definition of Volatile Oils.

When Gmelin attempted to define organic chemistry in his Handbook he supplemented his definition by the statement that the difference between organic and inorganic chemistry was sooner felt than defined. The progress made in recent years in the study of their chemical constituents has by no means made it easier to define volatile oils. The examination of the volatile and fatty oils of saw palmetto render it not improbable that decomposition products of the latter may become constituents of the former. The very interesting investigations of

neroli oil by Hesse and demascena oil by the chemists of Schimmel & Co. indicate what one may expect in the nature of basic nitrogenous compounds. Indeed, there seems no longer any valid reason why e.g., the alkaloid coniine should not be regarded as the volatile oil from the fruit of Conium maculatum. The term volatile oil and its synonyms are not chemical terms. Neither are they capable of chemical definition any more than the word alkaloid. The difference between the two can be "better felt than defined." We shall, therefore, have to be content with a kind of general though rather vague understanding as to what plant products are implied when we speak of volatile or essential or distilled oils. The last synonym is indeed a misnomer as applied to several volatile oils.

Classification.

With no definition that defines, we need not be surprised that the classification of volatile oils suggested by Dumas in 1833 is still adopted by textbook writers who think a classification of volatile oils a necessity. As long as oils were regarded as comparatively simple in composition there was an excuse for such a classification, imperfect even for the time when it was adopted. Its justification lay in the fact that it emphasized elementary differences and thus conveyed a meaning. To-day, when with but few exceptions volatile oils are regarded as very complex mixtures of which the essential constituent or constituents do not necessarily constitute more than a few per cent., or even a fraction of one per cent., of the entire oil, such classification is meaningless and therefore not only without value but positively harmful. Hence those who have made a careful study of the subject no longer make an attempt to classify volatile oils chemically. If a classification is desired it should be according to botanical source, which seems to afford the only rational basis for classification of the oils at present. Such a classification should prove valuable not only in the study of the chemical composition of the oils, but of systematic botany as well.

Classification a Chemical Problem.

The classification of the constituents of volatile oils is a chemical problem and is beginning to show elements of genuine progress. As long as the composition of a volatile oil was regarded as relatively simple, the differentiation between stearoptene and elaoptene, suggested by Berzelius in 1837, was of some value. Later, when the hydrocarbons $C_{10}H_{16}$ attracted so much attention, their classification by Berthelot (1862), Gladstone (1864), Tilden (1875) and Wallach (1887) were naturally regarded as the most important contributions to this chapter. The discovery of the so-called aliphatic terpenes and their derivatives by Semmler, however, emphasized the necessity of a broader basis. That the principles of this classification must be the same as those of organic chemistry at large is becoming more and more apparent. The general thought to be pursued was outlined by the writer in his address as chairman of the Scientific Section at the Baltimore meeting of the American Pharmaceutical Association. He hopes to be able to present a detailed classification of all constituents isolated from volatile oils in a not distant future.

Nomenclature.

In the thirties, when a formidable beginning was made in the chemical investigation of volatile oils, it was not uncommon to substitute the name of the oil for a part thereof. Derivatives of certain constituents of an oil were spoken of as derivatives of the oil itself, e.g., lemon camphor, a derivation of limonene, one of the constituents of lemon oil.

The term camphor, as applying to an artificial compound, was given to pinene monohydrochloride because of the resemblance in odor and appearance of this compound with natural camphor. When dipentene dihydrochloride was later prepared from lemon oil in the same manner in which pinene monohydrochloride had been prepared from turpentine oil, it was designated artificial camphor of lemon. Later, a liquid hydrochloride, a mixture of several substances, was obtained in like manner, and it was called "liquid camphor of lemon." Thus the door was thrown wide open to all sorts of abuses. The term camphor applied not only to solid substances of different composition and belonging to different classes of compounds, as, e.g., camphor, a ketone, $C_{10}H_{16}O$; borneo camphor, its reduction product, $C_{10}H_{17}OH$; mentha camphor, a secondary alcohol. $C_{10}H_{19}OH$; cubeb camphor, a tertiary alcohol, $C_{15}H_{25}OH$; artificial camphor, pinene hydrochloride, $C_{10}H_{17}Cl$, etc.; but also to a variety of liquid compounds and even mixtures. All compounds having the composition $C_{10}H_{16}O$ were by some designated camphor; liquid borneo camphor was any compound having the composition $C_{10}H_{18}O$.

Berzelius criticised this practice and introduced the terms stearoptene (*στέας*, tallow, and *πτήνον*, volatile) and elaoptene (*ἔλαϊον*, oil, and *πτήνον*), but thereby simply added to the confusion, for the general terms camphor and stearoptene were by some used synonymously.

The hydrocarbons, $C_{10}H_{16}$, have early attracted the attention of chemists interested in the composition of volatile oils. With no means of definite characterization each fraction $C_{10}H_{16}$ from any volatile oil was given a special name, often reminding of its source. Thus we find the name citrene given to what we now know to be d-liminene from oil of lemon, carvene to the same compound from oil of caraway. Moreover, different names were sometimes given to the same compound from the same source. Names were also given to mixtures and to hypothetical compounds. As a result we to-day find as many as twenty and more synonyms for the same compound.

A Babel of Terms Led to Confusion.

This confusion of names rendered the comparative and historical study of the chemical literature on volatile oils very difficult and thereby impeded progress. It was not until Wallach, utilizing the discoveries of Berthelot, Tilden and others, and adding to them important methods of characterization of his own, carefully and persistently reinvestigated the entire known field and branched out in all directions, that light and order were introduced into a branch of chemical literature, which had become well nigh distasteful because of the Babel of terms encountered in its literature.

The subject of nomenclature, however, is by no means in a satisfactory condition at present. According to v. Baeyer's application of the Geneva Congress nomenclature, a terpene is no longer a terpene, but a terpadiene. In order to avoid confusion, Wagner suggested the term menthene for this new use of the word terpene. The result is that menthene and terpene are used not only synonymously, but differently as well, each with its special meaning. According to v. Baeyer, the word terpadiene, the older terpene, was to apply to dihydrocymenes. Recent investigations have shown that possibly most of the known natural "terpenes" are not true dihydrocymenes. As a result, the father of all "terpenes," the pinene, should logically be excluded from the group of "terpenes." This, however, will not be done, any more than sodium chloride, that substance which had given its name to the class, could be stricken from the genus salt, as was attempted by some chemists about the middle of the century. The only salvation out of this confusion lies in the clear revelation of the constitution of the substances involved and in the application of rational principles of nomenclature based on a broad foundation such as those of the Geneva Congress of 1893.

Influence of Methods of Preparation on the Composition of Volatile Oils.

The most common method of preparation of volatile oils is that of distillation with water or steam. Formerly all oils were distilled alike. To-day the rational manufacturer treats oils as so many individuals, the peculiar characteristics of which must be taken into consideration in order to obtain the best possible product and the largest possible yield. Indeed, the subject has been placed on a scientific basis resting on a knowledge of the constituents of the oils.

Much depends on preliminary treatment, upon small differences in the temperature employed, etc. Thus it has recently been shown by Gadamer that such an excellent chemist and observer as A. W. v. Hofmann obtained decomposition products by the old style empiric distillation of crucifers. That some oils will suffer materially in commercial value by steam distillation has long been known, e.g., the oils of orange, lemon and bergamot, but the reason was not apparent until quite recently. Some of the finest perfumes are made, not from the volatile oils, but from pomades in the preparation of which water is avoided. Even the capacity of the condenser, influencing the rapidity of distillation, may be an important factor. The "olefinic terpenes" already mentioned will not stand a rough treatment of prolonged exposure to high temperatures, but will resinify and be lost. The volatile oils of cloves and bay of to-day are a different product from what they were ten years and less ago. The progressive manufacturer no longer prepares these oils with physical constants as given in the last edition of the Pharmacopœia. A pharmacopœial oil is therefore either made according to an antiquated method, or it is contaminated. These few instances may serve to show how the composition of an oil from one and the same source may differ materially according to the methods of preparation and the apparatus employed.

Chemistry of Constituents.

To give a comprehensive view of the progress made in the study of the composition of volatile oils and of the individual constituents, is out of the question. The reader may be reminded of the fact that, e.g., oil of peppermint, which was formerly supposed to consist of only a few constituents, has been shown by Power and Kleber to contain about twenty. Even now, no one acquainted with the facts will suppose that this one subject has been exhausted. If a fraction constituting but one or two per cent. of the total oil can be made to reveal five and more constituents, it would seem that the investigation of the chemical composition of the oils had scarcely begun. Rational methods of preparation have shown oils as formerly obtained to consist principally of decomposition products. Substances long ago prepared synthetically and supposed to be of no value as "odors," when prepared not "chemically pure," but "biologically pure," and in the proper dilution and dissolved in the proper solvent, have revealed themselves as important odoriferous constituents of oils.

That in spite of the many drawbacks such great advance should have been made during the past fifteen years in the study of the compositions of volatile oils is due very largely to the study of constituents from what is commonly regarded as the standpoint of theoretical or pure chemistry.

The facts that have accumulated in recent years on this subject well nigh fill a volume and a discussion of them here is out of the question. Suffice it to state that they are representatives of various degrees of saturation from Cn H2n + 2 to Cn H2n — 8, and possibly lower. There are paraffin hydrocarbons, olefines, diolefines and their derivatives, all chain compounds. Of the cyclic compounds, some are monocyclic, others di- and polycyclic; some are carbocyclic, others heterocyclic. There are, e.g., cyclodecanes, cyclodecenes, cyclodecadienes, dicyclodecanes, benzene homologues and their derivatives, etc.

Besides hydrocarbons, there are alcohols (primary, secondary and tertiary), aldehydes, ketones, acids, ethers, esters, oxyacids and lactones, oxides, etc. All of these are oxygen derivatives. The number of sulphur compounds is much smaller, but new light is being thrown on them at present by several investigators. In addition to the cyanides and isothiocyanates, nitrogen has recently been found in basic forms, such as amidobenzoic acid and similar but more complex compounds.

Rational methods for the search of all these compounds in volatile oils are rapidly being developed. Not only are individual compounds being well characterized, but the study of group reagents has made considerable progress.

Chemical Examination and Assay of Volatile Oils.

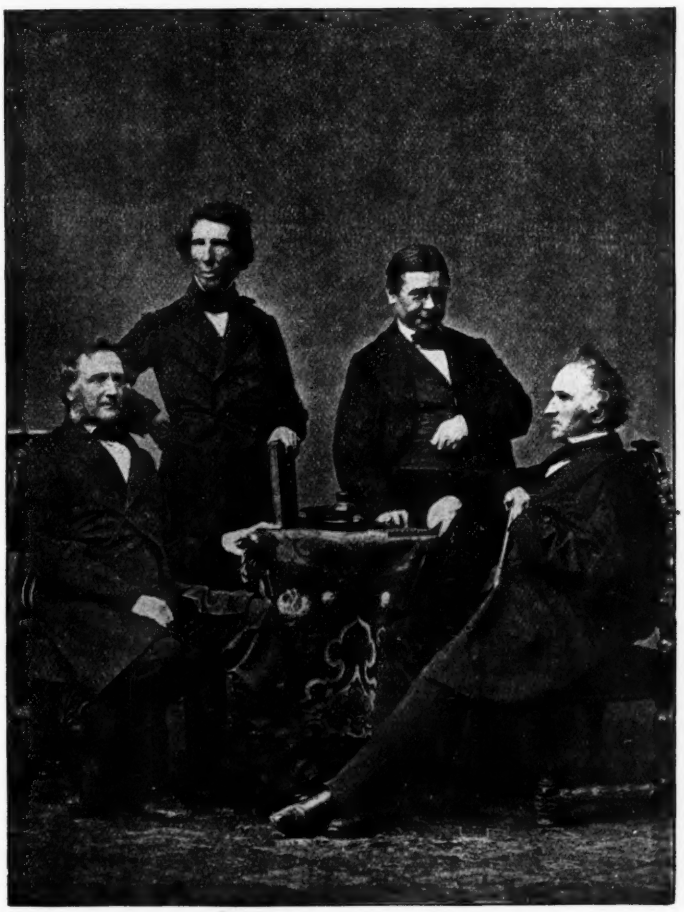
With the advance in the study of the composition of volatile oils and the structure of their constituents, it is but natural that a more rational examination and assay of volatile oils should progress hand in hand. Thus, e.g., the assay of cineol-containing oils, of those containing carvone, methyl salicylate, thymol, etc., has received considerable attention. It is, however, much easier to work out a quantitative method, e.g., for pure thymol, than to apply such a method to various oils containing a variety of substances in addition to thymol that are affected in a variety of ways by the reagent or reagents employed. A striking illustration of how carefully such methods should be studied before much reliance can be placed upon them is shown by the acetylization method as applied to the assay of free alcohols. This method is scientific and up to date, as it were, yet it has been shown by a few preliminary experiments that such hydrocarbons as pinene and limonene may assay from ten to twenty per cent. alcohol under certain conditions. This subject, therefore, demands much detail work before even the most "scientific" methods will be of great practical value.

The Literature of the Subject.

The literature on this subject consists largely of contributions on individual subjects. The numerous contributions by Wallach are principally in Liebig's Annalen, some also in the Berichte, the Proceedings of the German Chemical Society. Those of v. Baeyer, Tiemann and Semmler are to be found almost exclusively in the Berichte. The reports of other investigators are also to be found in these journals; the Journal für practische Chemie, the Journal of the Chemical Society, the Comptes rendus, the Bulletin de la Soc. chim., and scattered in various other chemical proceedings and journals. Of pharmaceutical journals the Archiv für Pharmacie and the Pharmaceutical Review and Archives may be mentioned, also the Chemist and Druggist, which has contained numerous reports on commercial oils.

About ten years ago Wallach summarized his results in the form of a lecture delivered before the German Chemical Society and published in their Proceedings for 1891. His former assistant, Heussler, published a monograph on "Terpenes and their Derivations" in 1896, which is indispensable to the scientific chemical student of volatile oils.

The more general work by Bornemann, which contained the early results of Wallach, was only last year displaced by the excellent treatise of Gildemeister and Hoffmann, published under the auspices of Schimmel & Co., of Leipzig. This comprehensive treatise of 900 pages is an excellent monograph on the subject of volatile oils, including everything from their history to their use. It is being translated into French and English. In addition there are other smaller volumes on the volatile oils and aromatic synthetics, some of them written primarily for the perfumer, whereas Sawer in his Odorographia has treated the subject principally from the botanical standpoint.



A Group of Famous German Chemists.—Liebig, Wohler, Kopp and Buff.

A Review of Some Lines of Industrial Chemistry.

By Prof. Samuel P. Sadtler, Ph.D., F.C.S.,

Professor of Chemistry in the Philadelphia College of Pharmacy; Author of "A Handbook of Industrial Organic Chemistry;" Chemical Editor of the "U. S. Dispensatory."

To write a record of the achievements of Industrial Chemistry during the century which is just ending, or even to properly present the history of individual industries like that of coal tar and its derivatives, would expand this article to the limits of a good sized book. The most that will be possible will be to pass in brief review a portion of the field of applied chemistry and call attention to the radical changes which have been wrought in the older industries and the creation of some equally important new ones in that part of the century approximately within our recollection.

Fuel the Foundation.

The foundation stone upon which every manufacturing enterprise must be built is fuel or other source of power, and according as this is cheap and abundant do we have a reasonable prospect of success. From this point of view all branches of industry, and among them chemical manufactures, have developed and prospered in a way surpassing the wildest dreams of a century ago. It is only necessary to recall that the fuel in common use at the beginning of this century was largely wood, and, for metallurgical purposes, charcoal produced therefrom, bituminous coal having a limited application only.

Early in this century

The Discovery of Anthracite Coal

supplied to the manufacturer a new fuel of the highest value, and from 1850 on began the coking of bituminous coal, furnishing a fuel specially adapted for metallurgical work.

In 1899 the production of anthracite coal in this country amounted to 56,679,525 tons, of bituminous coal to 187,843,750 tons, and of coke to 19,344,883 tons. In England during 1898, 202,000,000 tons of coal were produced, while in 1800 it was 10,000,000 tons.

Petroleum and Natural Gas.

In 1859 came the discovery of the Pennsylvania petroleum deposits, and in 1866 the acquaintance with the Russian oil fields, and the exploitation of these great natural supplies of heating and lighting material has had not a slight influence upon the development of numerous lines of chemical industry. Nor must we overlook the related production of natural gas, one of the most valuable of fuels, in fact an almost ideal fuel for metallurgical operations. The value of this as produced in the United States during the year 1898, for instance, was $15,296,813.

Gas, Petroleum and Electricity.

Closely related to the subject of fuels is that of illumination. The eighteenth century was the era of candles and tapers, the nineteenth that of gas, petroleum and electricity. The use of illuminating gas, which began with Murdoch in 1798, has just closed its centenary. The earlier form of illuminating gas, which was exclusively coal-gas, was in time replaced somewhat by the more recently discovered water-gas, which latter was capable of use as a cheap fuel-gas, or, after carburetting, as a substitute for that made from coal in the gas retort. Since early in the sixties gas has had to share the illuminating field, however, with the cheaper petroleum oil distillates burned in portable lamps of various forms. Within two decades past electric lighting has developed with giant strides and for a time threatened to displace both gas and petroleum for illuminating purposes. It seems, however, that with the aid of the principle of incandescence, as illustrated in the Welsbach mantel, there is still room for gas and oil to exist alongside of electricity as sources of light. At present, at least, the argument as to economy and superior illumination seems to be in favor of the Welsbach gas light as compared with the incandescent electric light. Moreover, the very newest plants for gas manufacture propose to utilize the coke, tar and ammonia water so thoroughly as to produce the gas as a side product, the sale of which even at a very low price shall be clear profit.

Industrial Achievements.

Turning now to some of the standard lines of manufacturing chemistry, let us note the advances in connection with some well known products. The use of the lead chamber for the manufacture of sulphuric acid dates back to the middle of the eighteenth century. In 1827, however, the Gay-Lussac tower was added, effecting a great saving in the amount of nitre needed, and in 1859 came the suggestion of the Glover tower, which again improved the efficiency and increased the yield. However, it was reserved for the end of the century for us to see the most radical change, or as Prof. George Lunge[1] puts it, "the greatest revolution which has taken place since that acid became a commercial product in the days of Ward and Roebuck." The new process dispenses with the use of lead chambers, and even the use of nitrous fumes, as oxygen carriers, and causes SO_2 and O to unite in the presence of substances like platinum sponge, ferric oxide, and other porous material. It is claimed that not only fuming sulphuric acid, but that of ordinary strength can be made more cheaply in this way than with the old lead chambers.

In the case of the alkalies and their carbonates we have no such wonderful revolution to chronicle, but a series of interesting changes during the century. The Leblanc process was first put into commercial operation about 1824 in England, and was the only practical process for the manufacture of sodium carbonate and hydrate until the rise of the ammonia-soda process in the hands of Ernest Solvay about 1860. This has steadily gained upon the older process until it now yields more than half of the entire annual production.

[1] Journ. Soc. Chem. Ind., 1899, p. 899.

Within the last few years several electrolytic processes for the production of caustic soda and potash from the chlorides of sodium and potassium respectively have established themselves, and according to Lunge,[2] electrolytic plants now at work, or projected, will produce 82,560 tons of caustic soda and 17,280 tons of caustic potash annually.

Chlorine and Bleaching Powder.

The history of the chlorine and bleaching powder industry is somewhat analogous to that of the alkali manufacture. Starting the end of the last century with the discovery of chlorine by Scheele and the manufacture of bleaching powder by Tennant, already in 1789 we have only to chronicle the great improvement of Weldon in 1866 for cheapening its manufacture by the regeneration of the manganese dioxide until, in quite recent years, the electrolytic methods for chlorine production have been brought out. According to statistics of Professor Borchers, quoted by Lunge,[3] the electrical plants already in existence or building are capable of supplying 225,000 tons of bleaching powder, which is probably equal to the present consumption of the whole world. Surely manufacturing chemistry will soon be leaning strongly upon the arm of her sister science, electricity.

Metallurgy.

If we turn to the side of metallurgy we see in many cases the same story. Let us illustrate by the example of the revolution wrought in the manufacture of the light metals, sodium, magnesium and aluminum. These metals had been obtained early in the century by Davy and Wöhler, but their preparation was tedious and costly, the latter requiring the use of the first in their manufacture. All are now made at a fraction of the former cost and have found new and extended industrial uses. Indeed the development of aluminum is little less than marvelous. The first production in the United States was in 1883, when 83 pounds were manufactured, with a value of over $10 per pound; in 1899, 6,500,000 pounds were manufactured, with a value of 35 cents per pound.

Fertilizers.

Still another branch of inorganic chemical industry of the greatest importance which has developed to surprising figures within relatively recent times is the preparation of inorganic salts for fertilizer purposes. We may include under this head potash minerals, native nitrates of soda, ammonia sulphate, and phosphates, both natural and manufactured.

The world's supply of potash salts, with the exception of salpeter, is derived from Germany, where both the chloride and the sulphate occur in the extensive rock salt deposits. The magnitude of the industry in these potash salts so indispensable for use in enriching the soil may be seen from the figures showing the sales of the "Kali-syndicate" for 1898, which amounted to 990,998 metric tons of carnallite (double chloride of potassium and magnesium) and 1,083,476 metric tons of kainite (double potassium-magnesium sulphate). In the case of the kainite,

[2] Journ. Soc. Chem. Ind., 1899, p. 899.

[3] Ibid., p. 896.

all but a small fraction of the amount stated is used direct for fertilizing purposes. The nitrate of soda found so abundantly in Chili is used both for fertilizing purposes and as the raw material for the manufacture of salpeter and nitric acid. The exports of the sodium nitrate from Chili amounted in 1899 to 1,360,000 long tons.

Sulphate of ammonia is another commercial product by means of which the element nitrogen can be returned to the soil. It is obtained mainly from the ammoniacal liquor of the gas works, but, in recent years, in addition in connection with the coking of bituminous coal. The present production of ammonium sulphate in Great Britain is given as 202,000 tons, and if the coke ovens of that country were all equipped for collecting the ammonia, it is estimated there would be an additional yield of 110,000 tons.

Statistics are not available for the production from gas works in this country or from the recovery ovens so largely used in Germany, but the amount is certainly large.

The Production of Phosphates.

Much larger than any of these, however, is the present production of phosphate rock (the basis of phosphate and superphosphate fertilizers) throughout the world. The production in the United States alone for 1899 was 1,738,372 tons, valued at $8,361,269; while that of the rest of the world is nearly as much more, the chief countries furnishing it being France and Algeria.

But if industrial chemistry has had this great development along the lines of inorganic compounds, still greater has been its growth in the domain of organic chemistry, within the century now closing. For a first illustration let us take the sugar industry.

The Beet Sugar Industry.

The sugar cane has been known from early historical times, and at the beginning of this century supplied the world's demand. Early in the century, however, the cultivation of the sugar beet was begun, fostered by the efforts of Napoleon to cut off England's colonial trade, and first in France and later in Germany developed until the production of sugar from that source has distanced that from the sugar cane. For the year 1899-1900 the production from the sugar beet throughout the world was estimated at 5,500,000 tons, while from the sugar cane the production was put at 2,904,000 tons. In the United States we are now witnessing a wonderful development of the beet sugar industry. For the year 1898-99 the production was 40,000 tons, and for the year 1899-1900, now finishing, it will be 95,000 tons, with single States, which have not hitherto taken part in the production, like Michigan, expecting to turn out from 35,000 to 40,000 tons in another year. Our cane sugar production at the same time remains at about 130,000 tons yearly.

Growth of the Coal Tar Industry.

Even more wonderful has been the growth of the coal tar industry and the production of a vast number of useful and valuable products from it. The first distillation of coal tar dates from 1822 and was carried on at Leith in Scotland, but it was not until the middle of the century that, with the discovery of the first aniline dye-colors, the distillation of coal tar began on the scale now carried out. At the present time not only is the tar from the coal-gas manufacture worked for the extraction of its valuable constituents, but coke-oven tar, blast furnace tar, water gas and oil gas tar are all utilized.

Coal Tar Products.

From these tars are extracted the aromatic hydrocarbons, benzene, toluene, and xylene, phenol and cresol, naphthalene and anthracene, together with technically valuable mixtures like the creosote oils and the roofing pitch. The annual production of tar in Great Britain as long ago as 1885 was given at 558,780 tons, that for the United States in 1898 was about the quarter of this, and allowing for that of the several European countries, it is safe to say that nearly or quite 1,000,000 tons of tar are produced annually.

Some Great Achievements.

From the constituents of this tar before mentioned are now obtained the wonderful "coal-tar colors." The manufacture of these colors is one of the proudest records of modern industrial chemistry. Natural colors like madder, cochineal, and even indigo, either have been or are now being driven out and replaced by the brilliant artificial colors obtained from what was at one time thrown aside as a waste product and at a saving of millions of dollars over the cost of the natural occuring materials. Immense industrial establishments, employing thousands of skilled workmen, have also been created by the utilization of waste products which chemical knowledge has made possible. Moreover, within recent years synthetic organic chemistry has extended her domain from the field of dye-colors to that of medicinal compounds. Not only are carbolic acid, acetanilid, benzoic and salicylic acids prepared in a pure state for medical purposes, but, under the fanciful names of aristol, antipyrin, iodol, phenacetin, sulphonal, trional, saccharin, salol, betol, a host of complex organic compounds have been offered to the public as proprietary medicines.

The Manufacture of Paper.

Of wide-reaching importance has been the industrial development of cellulose and its products. With the increasing demand for printed books and, above all, the wonderful growth of newspaper and magazine literature during the latter half of the nineteenth century, the manufacture of paper has outstripped the wildest estimates.

According to recent figures the present annual production of paper throughout the world is 1,800,000,000 pounds, of which half is used for printing, one-sixth for writing, and the remaining one-third for miscellaneous purposes. The original source of supply for the paper manufacture, viz., linen and cotton rags, can only meet a portion of the demand. In consequence we have the large and increasing utilization of esparto, straw, hemp, jute and, above all, wood fiber to furnish the needed cellulose. In this way the flourishing wood pulp industry has grown up, converting the fiber of the chipped wood into a pure white pulp by the soda and the sulphite processes.

Cellulose Compounds.

But not only is the cellulose needed for paper manufacture. By conversion into nitrocellulose we have the basis for the manufacture of pyroxylin or soluble cellulose nitrate, yielding collodion and celluloid with related products and the insoluble cellulose nitrate used as explosive guncotton. Within recent years the manufacture of the cellulose nitrates has assumed still larger importance because of the rapid introduction of smokeless powders. The basis of all of these is a nitrocellulose, gelatinized by the aid of a solvent and mixed either with nitroglycerin or other nitro-derivative or inorganic nitrate.

Chevreul's Discovery.

The industries of the natural fats, with which the production of glycerin and nitroglycerin is connected, is all a growth of the century. Beginning with Chevreul's classic discovery of the composition of the fats in 1823, we have had developed the soap industry, the candle industry, the discovery of glycerin and its derivative nitro-glycerin, the industry of the drying oils and varnishes, not to speak of the preparation and purifying of a long list of vegetable and animal oils and fats for food products and technical utilization, as lubricants, illuminants, etc.

Electro-Chemical Research.

Reference has already been made to the valuable aid of electricity in connection with the manufacture of bleaching powder and chlorate. Its importance to many organic industries might also be noted and especially its importance as an aid to both analytical and synthetical work. The list of organic compounds formed by the aid of the electric current, effecting either oxidation or reduction, as desired, is already an important one and is increasing. Indeed the field of electro-chemical research is one of the most promising at the present moment in the whole range of chemical study and one the practical applications of which are sure to be of not less importance.

EARLY DAYS IN NEW YORK.

The wholesale dealer in drugs of sixty or seventy years ago did not have the comparatively easy life of his prototype of the present day. Before the railroads had come into existence, the only facilities for shipping his merchandise were afforded by the ships and the Erie Canal. The ordinary hours for work were from seven o'clock in the morning until nine o'clock at night, and when the Erie Canal opened up in the spring there was a great rush of trade which necessitated the entire working force to remain at their posts until midnight. The leading druggists of the day were men of a very superior class, educated gentlemen of high social standing and successful in business, but midnight found them at their desks every night in the busy season, in company with their most humble clerks. The selling terms were six months and five per cent. off for cash. Interest was charged after six months, and sometimes the Southern trade would take an extra six months when the cotton crop failed. Better banking facilities later on shortened the credits. At the outbreak of the Civil War many outstanding accounts had to be canceled, but though many houses went out of existence at the time, the failures in the wholesale drug trade were very few.

The Educational Condition of American Pharmacy.

By Oscar Oldberg, Phar.D.,
Professor of Pharmacy, etc., and Dean of the Northwestern University School of Pharmacy.

THE first General Pharmacopœial Convention was held in Washington, January 1, 1820. It assembled at the call of twenty medical societies and schools. The Pharmacopœia prepared by the authority of that convention was published December 15, 1820. The pharmacists did not take part in either the convention or the work, nor in the revision of 1830. After 1840 the work of revision was participated in by pharmacists, and they were represented on the convention of 1850 and in all subsequent pharmacopœial conventions.

The first effort to establish a pharmaceutical school was made in Philadelphia, where the "College of Apothecaries," afterward called the Philadelphia College of Pharmacy, was organized in 1821, the year following the publication of the first American Pharmacopœia. Similar movements were undertaken in New York in 1831, Baltimore in 1841, Boston in 1851, Chicago in 1859, and St. Louis in 1865. But regular annual courses of instruction were not at once inaugurated in all of these colleges of pharmacy. In 1867 a school of pharmacy was established in the University of Michigan. "Colleges of Pharmacy" were started also in Cincinnati and Louisville.

Fifty years after the organization of the College of Apothecaries in Philadelphia there were nine pharmaceutical schools in existence, but some of these had not yet become well established.

During the next twenty years the number of pharmaceutical schools increased to nearly thirty, and in this last year of the nineteenth century there are over fifty institutions conferring pharmaceutical degrees in the United States.

Graded courses of instruction in pharmacy were first given in the University of Michigan, which was also the first pharmaceutical school that included laboratory work in its obligatory courses. The second pharmaceutical school to introduce graded courses was the Philadelphia College of Pharmacy (1879), but it was not until fifteen years later that all of the colleges of pharmacy which existed in 1871 had adopted that system.

The "American Journal of Pharmacy" was established in 1825, and the American Pharmaceutical Association in 1856.

Laws regulating the licensing of pharmacists, with the view of protecting the public health have been enacted in one State after another until such laws now exist in nearly all of the American States.

Pharmaceutical examining and licensing boards, called Boards of Pharmacy, have been established to execute the pharmacy laws.

More than a baker's dozen of pharmaceutical periodicals are published in the United States, some of which render valuable aid in the dissemination of scientific technical knowledge and in the discussion of educational questions, while others are devoted to the commercial interests of the retail drug trade.

From this brief historical review it would appear that there has been, upon the whole, great activity in matters intimately connected with American pharmaceutical educational progress during the century now about to close.

Our actual achievements, however, have not been commensurate with that activity.

Twenty-five years ago the courses of education in our best colleges of pharmacy were probably as far advanced in proportion to the requirements of pharmaceutical practice as the courses in the medical colleges were in proportion to the requirements of the practice of medicine. But the best medical schools have developed more rapidly than the best pharmaceutical schools. Full four years' courses in medicine are now the rule, and six years' courses are already among the probabilities of the next decade. But very few pharmaceutical colleges have yet been able to establish courses occupying one-half as much time. The principal reason for the greater advance in medical education is readily seen to be the fact that law and public opinion demand all that the medical schools are doing, while no standard of pharmaceutical education prevails.

The Pharmaceutical Schools.

With regard to organization and government there are four classes of pharmaceutical schools—1, those maintained by universities; 2, those conducted by local pharmaceutical societies (several of these colleges are nominally departments of universities, but in reality quite independent of them and financially altogether dependent upon their own resources); 3, those carried on in connection with medical colleges; and, 4, schools attached to or run as a part of private business enterprises.

But the efficiency of any kind of a school must depend upon its faculty, equipment, and work, rather than upon its organization and government.

Men of distinguished ability in their special fields of work, and, at the same time of broad education, can, for obvious reasons, not be numerous in the ranks of pharmacy in the absence of any considerable demand for their services; but America is not without sufficient experienced pharmaceutical teachers to make up a dozen or more faculties such as would command more than a local recognition as safe leaders in their profession.

In these days of unprecedented development of laboratory training, and when really valuable technical education is wholly unattainable except by modern laboratory methods, the efficiency of a college is quite naturally, and in most cases correctly, measured by its house and the laboratories it possesses. A college of pharmacy fully equipped, so as to be able to give proper attention and laboratory facilities to one hundred students, must in our day be provided with a building costing not less than $50,000, and the necessary furniture, fixtures, apparatus, specimens, materials, books, and other accessories costing from $15,000 to $30,000 more. Then the current expenses of a pharmaceutical school capable of accommodating one hundred students profitably occupying their whole time upon their school work are about $6,000 per annum, not including rent and the faculty pay roll. From these estimates, based upon reliable data, it is evident that a well equipped school of pharmacy is a very costly establishment, and that the rapid increase of the number of schools conferring pharmaceutical degrees must be regarded as one of the serious evils which threaten the cause of pharmaceutical education, for the number of colleges or schools of pharmacy, properly prepared to do good work must, of course, be very far from fifty, although there may be, perhaps, a dozen pharmaceutical schools, each of which possesses adequate facilities for more than one hundred students.

It was probably at one time true that nearly every college, however small and poorly equipped, if remote from any other college, was better than none; but no technical or professional school in the last year of the nineteenth century has any moral right to exist unless it is provided with proper laboratory facilities and competent teachers and gives good and sufficient courses of instruction, for the evil consequences of the operation of ill-provided schools far outweigh any good they may possibly accomplish. It is not to be expected that medical, pharmaceutical, dental and law schools shall be found anywhere except at university seats and in large cities where they can be maintained in a reasonable degree of efficiency. But—we are told—"this is a free country," and weak colleges are not discouraged.

It is time, however, to demand that certain well defined courses of special education in pharmaceutical schools shall be prescribed as a necessary precedent to registration under the pharmacy laws, and that no credit shall be given for courses below the standard adopted.

Uniform Minimum Educational Requirements.

The Board of Pharmacy of Illinois has officially set its seal of disapproval upon any pharmaceutical college courses occupying less than twelve months or comprising less than one thousand hours' instruction. This declaration may well be adopted as the basis for a common agreement between all the State Boards, for many of the best colleges have already more extended courses than that, and many others can and must come up, to that minimum, if prescribed. There is no danger that any school which gives a more substantial course will lower its requirements. The Board of Pharmacy of Illinois has rendered great service to its State and set an admirable precedent by its very definite descriptions of the scope of its examinations, for it explicitly states that the minor examination for the grade of Assistant Pharmacist traverses the ground which, in its opinion, should be covered by the "junior course" in a good college of pharmacy, and that the major examination for the grade of Registered Pharmacist is intended to cover the ground of the "senior course" in such a college.

The Junior Course.

The Illinois board has, therefore, in effect, declared that the minimum junior course in a good school of pharmacy must extend over not less than six months, that it must embrace not less than five hundred hours' instruction, and that it should be devoted to the following subjects, and so conducted that the students may be able to pass the examination described by the board in these words:

1. Structural Botany. A sufficient ac-

quaintance with vegetable cells and tissues and with the structure and organs of plants to understand the pharmacopœial descriptions of plant drugs, and to enable the candidate to use the official text intelligently for the identification or verification of such drugs. The candidate must be prepared to point out and name distinct and important features of drug tissues in specimens, sections and characteristic illustrations used in the examinations.

2. Pharmaceutical Nomenclature. A good command of the technical official titles and common names of drugs, chemicals and pharmaceutical preparations.

3. Weights, Measures and Pharmaceutical Arithmetic. A knowledge of the Metric System and of the customary weights and measures is required, and the ability to solve promptly any problems in specific gravity, percentage, proportions, adjustments and calculations of strength of medicines, doses, etc.

4. General Inorganic Chemistry. Candidates are required to be familiar with the fundamental laws and theories of general chemistry, such as the atomic theory, valence, etc.; with chemical notation and nomenclature; and with the general character, structure and classification of inorganic chemical compounds. A sufficient command of this subject is necessary to enable the candidate to state the cause and results of reactions occurring in common chemical processes, such as the action of metals upon acids and alkalies, the action of acids upon other compounds, reactions of combination and decomposition, oxidation and reduction, and other common reactions. The candidate must be able to read and write ordinary chemical symbolic formulas and equations without difficulty. A sufficient acquaintance with the most important elements and compounds and with their occurrence, production and properties, is also required.

5. Pharmacy. A satisfactory knowledge of pharmaceutical operations, processes and apparatus, the general character and classification of pharmaceutical preparations, and the general method of their production. Also a particular knowledge of the methods of preparation of common, simple pharmaceutical preparations.

6. The Pharmacopœia. A knowledge of the principal distinct parts of the text of the Pharmacopœia; its history, authority, and existing arrangements for its revision and publication.

7. Pharmacology. The candidate must have a satisfactory knowledge of the general character, source, action or uses, and doses of the most common or important organic and inorganic drugs and preparations of the Pharmacopœia, and a general elementary knowledge of the principal classes of substances contained in plant drugs, including their general composition and characteristic properties.

The ability to recognize at sight the most common of the important drugs is required.

8. The Art of Dispensing. A satisfactory knowledge of the construction and correct reading and interpretation of prescriptions, including ability to detect serious errors, incompatibilities and dangerous doses. Practical skill in preparing and dispensing medicines in a workmanlike manner.

9. Poisons. The candidate must know what medicinal substances have poisonous properties and the proper antidotes for same, also the general action and ordinary doses (as well as the maximum doses) of substances the use of which is attended with especial danger.

The Senior Course.

In the same manner the Illinois Board practically announces its opinion that the senior course in a pharmacy school should occupy at least six months, with at least five hundred hours' instruction, and should prepare the student to pass satisfactorily an examination described as follows:

1. Special Inorganic Pharmaceutical Chemistry. A good knowledge of the methods of preparation of important inorganic pharmaceutical preparations, and ability to explain the special directions and manipulations necessary to success in such work. Candidates are required to be able to outline methods by which inorganic chemicals may be prepared in accordance with the general principles of inorganic pharmaceutical chemistry.

2. Pharmacy. A thorough knowledge of the official processes of preparation of all important organic preparations of the Pharmacopœia.

3. Organic Chemistry. The candidate must be prepared to state and understand the relations of hydro-carbons, alcohols, aldehydes, acids and ethers to each other, and must know the composition and properties of the common or important organic medicinal chemicals, such as acetates, valerianates, citrates, tartrates, alcohols, chloroform, chloral, and the principal compounds of the fatty and aromatic series that possess special pharmaceutical interest. Also the processes of preparation and the reactions involved therein.

4. Systematic Botany. A general knowledge of the principles upon which systems of plant classification are based, and of the chief characteristics of natural orders distinguished for the number or importance of their medicinal plants.

5. Microscopy. The candidate must know the essential parts of the compound microscope and their uses, and must be able to use the instrument correctly, and to make and examine sections of drugs and other objects.

6. Qualitative Inorganic Analysis. A sufficient command of the principles and common methods of inorganic analytical chemistry is required to enable the candidate to understand and apply the pharmacopœial tests for the verification of the identity and purity of the official chemicals, with the aid of the pharmacopœial tests and reagents.

7. Volumetric Analysis. Sufficient knowledge and practice necessary for the application of the quantitative methods prescribed in the Pharmacopœia for the determination of the strength of acids, alkali solutions and other chemical preparations.

8. Drug Assaying, and the valuation of pharmaceutical preparations and the digestive ferments. A thorough understanding of the principles; and practical skill in the use of the official processes of assay.

9. Toxicology. A sufficient general knowledge of the action of poisons, symptoms of poisoning and of antidotes.

Are the Foregoing Requirements Practicable?

The teachers of the colleges of pharmacy may not agree with the Illinois Board as to all the details described, and many would wish that the standard might be much higher; but I am convinced that the general adoption of the minimum requirements suggested by that board would accomplish a very substantial improvement, and that it would be extremely difficult, if not impossible to secure the adoption of higher requirements for some years to come.

It would be wise, however, to strengthen the platform by the added precautionary proviso that no course in pharmacy should be accepted as sufficient which does not demand the regular personal attendance of the student in the instruction room and laboratories of the school from beginning to end, and that schools in which the courses are not arranged in any prescribed natural sequence or have no definite beginning and ending should not receive recognition.

General Education.

The most serious evil from which pharmaceutical education in the United States has always suffered, and which now threatens the very life of pharmacy as a scientific technical profession, is the deplorably low standard of preliminary general education of the young men allowed to enter upon the pursuit of the pharmacist's occupation. This lowers all other standards and must, so long as it continues, defeat any efforts to advance.

In this particular, too, the Illinois Board of Pharmacy distinguished itself by instituting a departure from the practice of the past. It subjects every candidate for registration to a preliminary examination in English, arithmetic, history and geography, to test his general education and intelligence, and any candidate who fails in the preliminary is barred from the other examinations. This measure deserves the hearty approval of the whole profession, not because it is in itself a great accomplishment, but because it seems to require an extraordinary amount of courage and firmness to do the most simple and necessary things, if these simple things are innovations liable to excite opposition on the part of the uneducated, unintelligent, and altogether selfish.

That the Illinois Board has been extremely cautious and moderate may be seen from the fact that it requires no more than a common public grammar school education. On this subject the board says:

> Applicants for registration as Apprentices in Pharmacy must be not less than fifteen years of age; they must be able to speak and write the English language correctly; they must have a knowledge of arithmetic, including the use of common and decimal fractions, percentage and proportion. They must be able to solve such problems as occur in the calculating of doses, weights and measures, computation of the strength of medicines, and the correct mathematical deduction of results from the various directions and processes of the Pharmacopœia; they must have sufficient education to be prepared to pursue the study of physics, chemistry, pharmacy and materia medica.

The Pharmacy Laws.

It was once the common belief that the pharmacy laws must aid and encourage pharmaceutical education. As a matter of fact, however, these laws are so extremely crude and defective, and are, as a rule, administered in such a way, as to do infinite harm to the cause of proper pharmaceutical education. One extremely bad feature of some pharmacy laws is that only one class or grade of pharmacists is established by them, so that employers and clerks alike must pass the same examination. This has the effect of dragging down the educational standard for the "Regisered Pharmacist."

The fatal defect in all the pharmacy laws is that no provision is made for the funds necessary to their rational and efficient enforcement. It is right and proper that candidates examined by the boards of pharmacy shall be required to pay a reasonable fee for the examination, and that such fees shall not be returned to unsucessful candidates; but these fees cannot be made so large as to defray the legitimate expenses of the boards. Even if an annual fee be exacted from all registered apprentices, assistant pharmacists, and pharmacists, or any of them, the revenue derived from such fees cannot and ought not to be made great enough to cover the whole cost of enforcing the law. The pharmacy laws are enacted for the protection and benefit of the people—not for the benefit of the pharmacist. The States, therefore, should make adequate annual appropriations for the proper performance of the legitimate duties imposed upon the boards of pharmacy, for the examinations held by them can never become such as they ought to be if the boards must be "self supporting."

The members of the boards cannot be expected to perform their duties without compensation, and the funds at their command are altogether insufficient. As a consequence the examinations are such as cannot but result in the failure of many fit candidates and the success of a far greater number of unfit ones. That this must continue to be the case under the present system is evident from the fact the cost of proper examinations would certainly be several times as great. The examinations now held occupy usually two or three half-days, whereas a rational, fair and thorough examination requires not less than three full days of the time of each candidate, and at least one additional hour of the time of each examiner for each candi-

date in conducting the practical tests, besides several days devoted to the examination of the written answers to the printed questions and problems submitted. We find that an examining board of from three to five members actually examines a hundred or more candidates and decides their fate within three days. Such a spectacle is sufficient to prove the worthlessness of the system. But the members of the board would be powerless to mend the matter, even if they very much desired it, so long as they have not the funds required to do better. They, therefore, ask only such questions as can be answered in a very few words, and chiefly from memory—questions which do not require any process of reasoning or mental work, and the answers to which can be rated at the least possible expenditure of time and thought; and absolutely no tests are made to determine the ability of the candidate to do any kind of work, except to dispense a few prescriptions. It must be remembered that the examiners have no previous knowledge of any of the qualifications of any candidate, and must decide solely upon the result of one examination.

I have seen numerous complete sets of questions actually used in such examinations, but I have so far seen comparatively few questions bearing upon their face any convincing evidence that the examiners were sufficient masters of the subjects in hand to hold such examinations as would command the respect and confidence of experienced, competent and clear headed teachers or well educated and skilled workers.

Candidates are, so far as I have been able to discover, never required to demonstrate their ability to understand and intelligently and corectly apply any of the pharmacopœial directions, tests or processes; the boards of pharmacy do not make any use of any chemical apparatus or reagents; no candidate is ever asked to verify the identity of any medicinal substance, or to demonstrate that he knows the meaning of the technical descriptions of drugs; no practical questions in vegetable histology are asked, and a lens or a microscope is not to be found in the examination rooms, nor a test tube or reagent. But the candidates are asked to guess the names of ten or twenty unlabeled drugs, chemicals and preparations, a performance the uselessnes and viciousness of which will be admitted by all intelligent and experienced men.

The questions asked in State Board examinations throughout the country are often questions such as many of the most reliable and well trained pharmacists might very probably be unable to answer, because they relate to details of no general bearing—isolated items such as any comeptent man never attempts to carry in his memory and which are generally looked up in reference books when wanted. Such questions should never be asked.

But questions which can be answered and problems which can be solved by processes of reasoning from general principles such as every candidate surely ought to know—these are the questions that ought to be asked, but are rarely found in the collections of State Board questions published from time to time.

Any intelligent teacher of pharmacy or chemistry would, of course, expect to find a considerable number of questions designed to test the ability of the candidate to write ordinary chemical equations; but such questions, although they are the most necessary and effective of all, are almost universally distinguished by their total absence from the State Board examinations in pharmacy.

We must conclude that under such conditions as these no substantial progress in pharmaceutical education is possible, for even if all the fifty schools of pharmacy were of the highest order, it is clear that the process by which candidates can successfully prepare for the State Board examinations must be pure, unalloyed cramming rather than any course of college training. The young men who successfully pass these examinations include a very large proportion who have never attended any pharmaceutical school and many who have not finished the junior course in such a school.

It is a common occurrence that young men who have entered upon a college course in pharmacy and have been in attendance upon the junior course for a few weeks, go before the board of pharmacy, pass the examination, and then at once discontinue their studies. In some cases which came under my observation quite recently the candidates were certainly educationally unfit to be registered, but they "passed the board."

Students who were found among the very poorest in the schools of pharmacy they attended, or who failed utterly in their college work, have passed the board examinations in various States, while some of the really good students and graduates of several of the best pharmaceutical schools in the country have failed in such examinations! These things happen all over the country—in the East as well as in the West. Are the examiners of the colleges or those of the boards at fault, or both?

As a matter of fact there are private cramming institutions advertising that they prepare candidates for these examinations in a few weeks and guarantee that their students will pass or fees will be refunded, which they are enabled to do because the proportion of young men who fail after a lively course of cramming is very small.

The Moral Duty and Responsibility of the Boards.

The boards of pharmacy have it in their power to direct the course of progress of pharmaceutical education in America, if they have the ability; and the responsibility for its unsatisfactory condition rests largely with them in every State where they make no effort to secure such amendments to the pharmacy laws as will enable them to improve upon their methods of administration.

Much—very much—can be done by the pharmacy boards even under the wretched laws we have, for they can at least insist upon a reasonably higher standard of preliminary general education; they can further adopt such a definite standard of college training for pharmacy as is necessary to fit students to enter upon and learn pharmacy, or to safely practice it after sufficient shop training; they can accept proper evidence of having completed such a course as far better proof of the candidate's knowledge of "chemistry, pharmacy and materia medica" than the result of any examinations that any State board can possibly undertake without annual appropriations from their respective States, and they can refuse to examine any candidates who have made no serious effort to properly prepare themselves for the profession.

In States where the law has created two grades of registered practitioners of pharmacy the boards should no longer continue to hold only one kind of examination, but should hold a minor examination for assistants and a major examination for those who seek license to conduct pharmacies on their own account. And in States where the minor and major examinations have already been established we have the right to expect that the boards will cease the indefensible and inconsistent practice of giving registration as assistants to candidates who take the major examination but fail to pass satisfactorily for full registration.

My own personal and official relations with members of various boards of pharmacy have been most cordial, but I have often seen and heard evidences of a mutual lack of friendly co-operation between boards and schools. Board members who fancy that they exercise a sort of censorship over the schools would do well to get better acquainted with the schools and with themselves, and college men who do not give the boards credit for an honest desire to do their duty are certainly mistaken. It would be pitiful if there cannot be full and frank mutual respect, confidence and co-operation between the two most important factors in the future educational development of our common profession. Common sense ought to teach that, while the boards of pharmacy ought not to include college teachers among their members, the college teachers must necessarily become the examiners for the boards whenever the system of legal regulation of the practice of pharmacy shall have reached the stage of that rationality which it now so conspicuously lacks.

It is practically certain that nearly all practicing druggists who will be appointed members of the State Boards of Pharmacy for many years to come will continue to be men known for their business prominence, their reputation as experienced, skillful and reliable pharmacists, and their popularity, rather than their qualifications as scientific and competent examiners. They should by all means continue to examine all candidates so far as concerns the character and sufficiency of their shop training, but they should not hesitate to employ experienced and scientific specialists as examiners in all other subjects. When that time comes—and it is sure to come—both the State Board members and the candidates who come up for examination will be greatly relieved, for the Board members will no longer be obliged to devote time taken from their business affairs to matters which are altogether foreign to their work, and the candidates will discover that the results of the examinations are not a question of chance and of cramming, but that a good, honest, substantial course of special education in a pharmaceutical school will certainly enable them to pass the Board if they can pass the college examinations.

The position taken by some that the Boards of Pharmacy do not possess the power to regulate these matters in a sensible way is puerile and untenable. It is, of course, their first duty to insist upon that all candidates must have studied chemistry, pharmacy, materia medica, etc., in a reasonably serious way before they can be entitled to an examination.

The Evolution of Pharmacy Laws in the United States.

By J. H. Beal, Ph.G.,

Professor of Pharmacy and Dean of the Scio College of Pharmacy, Scio, O.

A Perfect Law is a Growth, and Not a Creation.

IT is a well established principle of political science that human wisdom is unable to create at one effort a perfect code of legislation upon any subject of general public interest, and that a Legislature can no more manufacture at one stroke a perfect general statute than it can manufacture an ear of corn.

That systems of jurisprudence are matters of growth, and not articles of creation, is the verdict of universal history. The codes Draconian and Napoleon, the fine-spun schemes of civil government elaborated by the Lockes and Shaftesburys, and all the other constitutions and systems of jurisprudence of like birth, so far as they have violated this principle, have long ago gone into the dust bins of the ages. The institutions which hold society together, which guard civil and political liberties, and govern the contractual relations of society, have slowly grown by the accretions of centuries, and are the concrete expressions of universal experience.

The reason why these elaborate theories of government and elegant and logical systems of jurisprudence have so absolutely failed is that they were attempts to introduce forcibly new combinations into the complicated machine known as human civilization, and to compel by violent means their adjustment with the prior existing mechanism. Either the new wheels have utterly refused to work, or the adjustment of the entire mechanism has been disarranged and checked.

The exceptions to this rule are more apparent than real. The codes and constitutions, which have become a living part of jurisprudence, were not new creations by the legislators and conventions whose names they bear, but were only formal enunciations of well established legal principles which had been previously hammered out at the forge of experience.

The Foundation of Statute Law is Public Opinion Based Upon Experience.

If the philosophy of this principle be searched for it will be found in the fact that while statute law is nominally the pronouncement of the legislature, it is in truth and reality the expression of the opinion of the people, and this public opinion or sentiment, or whatever we may choose to call it, is itself a matter of growth, and is developed from experience. The only efficient legislation is that which is declarative of well founded pre-existing sentiment. An effective law is the expressed will of the majority designed to compel the recalcitrant minority to act in harmony therewith. Whatever the subject of legislation, whether trusts, corporations, currency, tariffs, department stores, or the regulation of professional services, it cannot become an effective, living part of the organic law unles it is based upon and backed up by overwhelming public sentiment.

Application to the Development of the Pharmacy Laws.

By bearing these principles in mind we can understand why pharmacy law has not had a more rapid growth in the United States, and also why so many of the enactments upon that subject have proved futile, and have failed to accomplish the results which their authors so fondly hoped for them.

They have lacked the two fundamentals of successful legislation, viz., the experimental foundation, and the support of public sentiment. Until the last half of the century the necessity for stringent regulation of the sale of poisons and the compounding of drugs did not exist, and as a consequence public sentiment in favor of such regulation had not yet come into being.

The practice of medicine, both professional and domestic, was confined to the use of a relatively small number of simple vegetable and animal preparations and to a limited number of simple inorganic compounds. The list of active poisons or of dangerously active substances was comparatively short. The immense number of the active products of synthetic chemistry now in use had not yet come into existence, the powerful alkaloids had not yet been isolated, while the drugs producing them were few in number, or not generally known as articles of commerce. Domestic medication confined itself to the herbs of the kitchen garden or to the products of the nearby fields and forests, while the compounded quack remedies of the time were generally confined to vegetable compositions of a harmless character, and their purchase and use were limited. Public sentiment was in accord with this order of things. The criminal use of poison was covered by the existing criminal laws against attempts upon life, so that the prohibition of the wrongful sale of poison was the only necessary regulation of pharmacy. And since the elementary state of the science was such that any one of ordinary intelligence could quickly equip himself to fulfill the office of an apothecary, and to distinguish between poisonous and non-poisonous substances, it was not vitally essential to prescribe educational qualifications for those who sold drugs.

Changes Introduced by the Advancement of Science and Commerce.

With the advancement of commerce and the progress of science the old order of things was completely altered, and conditions changed more rapidly than the education of public sentiment could change to keep pace with it. It is no longer sufficient to provide merely against the intentional wrong doing of the pharmacist: his competency must also be ascertained, and for this there is necessary the elaborate machinery of examining boards and their accessories. The progress of chemistry has multiplied the number of poisonous or, at least, of dangerous substances, a thousandfold, while the development of commerce and art has made their names familiar to every one, without creating a corresponding familiarity with their properties.

The housewife, when there is illness in the family, if she does not call a physician, no longer goes to the domestic stock of herbs, but sends to the drug store, and the list of remedies from which she makes her selection, learned from the ubiquitous newspaper or from the gossip of acquaintances, is almost as great as that of the physician himself. As common articles of household use we have acetanilid, antipyrine, carbolic acid, corrosive sublimate, potassium chlorate, bromide, and iodide, pills, syrups, tinctures, fluid extracts, and a host of other active substances.

From the foregoing considerations we deduce the following conclusions:

First—A satisfactory system of jurisprudence is a product of slow growth, and is gradually elaborated as the result of experience.

Second—The sudden development of manufacturing chemistry and pharmacy, and the popularization of the use of their products was so rapid and great that society was unable to adjust itself at once to new conditions, so that the necessity for restrictive legislation was sharply felt before a sufficient fund of experience had been accumulated to enable such a scheme of regulation to be planned.

Third—As a consequence of such lack of experience, the pharmacy laws were but tentative efforts, or experiments, made, as it were, for the purpose of collecting the data not previously at hand.

The Model Law of 1869.

Prior to 1869 there were but two laws in the United States requiring educational qualifications of those desiring to enter upon the practice of pharmacy; one in New York State applying to New York City alone, and the other to the State of Georgia. Both were brief and nearly ineffective, and in each case the license was to be obtained from a medical board.

At the 1868 meeting the A. Ph. A. appointed a committee consisting of Messrs. Wright, Milhau, Moore, Stearns and Maisch to prepare a draft of a law suitable to all the States, and to present the same at the next meeting. The committee performed the work assigned and presented the draft at the meeting in 1869, at Chicago, where it was liberally discussed, and finally ordered to be printed in the Proceedings, but without the formal endorsement of the association, as many of the members doubted the advisability of encouraging pharmacy legislation.

While the limits of both time and space forbid more than a most cursory review of this model, and of its comparison with the laws of later development, yet even this will we believe prove both interesting and instructive.

This model may be taken as a fair presentation of the best opinions of its time, and with all its faults was the broadest and most comprehensive conception of the subject that had yet appeared. Crude as it was, it has left a deep impression upon all subsequent legislation in the States, and there is not a law upon the statute books which does not contain some of its provisions in a more or less modified form. This fact, we think, should be a satisfactory

answer to those who contend that the preparation of a new model by the A. Ph. A. will be a useless waste of time. If the old model was effective in molding the laws in nearly all the States, why should the new model not prove equally useful in shaping future legislation?

In passing, it is but simple justice to the framers of the model of 1869 to defend them against the frequently repeated charge that their draft was but little more than a transcript of the English statutes of 1858 and 1864. Except in two or three of its sections the draft presented by the committee was almost wholly original work. In fact, the greatest objection to the model was its too great originality. Had it been less original it would probably have been more successful, and more closely copied by subsequent law makers. So far as the model adhered to well settled principles of jurisprudence, so far has it been perpetuated. In so far as it neglected these and sought to found new principles for itself it proved a failure.

Among the new features of this old law which are worthy of notice we may name the following:

(1) The machinery provided for the enforcement of the law was much more elaborate than would now be thought necessary. Among other features the model provided for the appointment by the Governor of a registrar who was not to be a member of the board of pharmacy, and the description of his powers and the regulation of his official duties occupy nearly one-fourth of the entire body of the statute.

In nearly all modern laws it is recognized that the formal act of registration and the publication of the register of legally authorized pharmacists can be much more conveniently performed by the secretary of the board than by an independent registrar, with a corresponding reduction of trouble and expense, and the removal of the chance of conflict between the board and an official not a member of it, and not subject to its authority.

(2) A fact which redounds greatly to the credit of the 1869 model is that even at that date its framers recognized clearly that the only basis for the enactment of a pharmacy law was public necessity, and not the especial benefit of the pharmacist, that the object of the law was the regulation of and not the protection of pharmacy. In their recognition of this fundamental principle the framers of the model were somewhat in advance of many of their successors. While not so common now as formerly, it has not been a great while since it was a frequent occurence for pharmacists to express their desire for laws which should give them better protection, as if they were entitled to favors not accorded to other professions or branches of trade.

(3) In no other feature of the law has there been such a marked change in opinion as has taken place in respect to the amount and kind of credit which should be allowed to graduates in pharmacy. The A. Ph. A. model proposed to admit graduates to registration without examination or other qualification than that the diploma should be from some regularly incorporated or chartered college. A few of the State laws adopted this provision in substance, but the majority of those which gave recognition to diplomas restricted such recognition to those which were issued by colleges requiring experience prior to graduation. Of late years, however, opinion upon this point has changed so rapidly that it is now quite generally admitted that the law should recognize no other avenue to registration than that of examination, and that this duty should be discharged by the boards of pharmacy, and not by institutions which cannot be made legally responsible for their acts. Those who advocate this policy claim that if a college education qualifies a candidate for registration, it should also qualify him for examination, and who will say that their contention is not correct? So cogent has this reasoning appeared to the law makers that nearly all of the later laws require the examination of all candidates, and this will most likely be the policy of all future laws.

(4) In still another way the A. Ph. A. model gave recognition to colleges of pharmacy that would hardly be accorded by a statute of the present day. This consisted in giving the colleges a direct hand in the control of the boards of pharmacy, by permitting them to join with the pharmaceutical associations of the State in nominating the persons from whom the Governor shall designate the members of the board, and in specifically naming professors of pharmacy as among those from whom members might be selected to fill vacancies in the board.

While not questioning the ability of professors of pharmacy to act as members of examining boards, it must be admitted that such a provision can be satisfactory only to those colleges which are fortunate enough to have representatives upon the board, and would be provocative of endless dissatisfaction and jealousy on the part of colleges not so represented. Fortunately this fact has been quite generally recognized, and very few laws at present in force recognize the colleges in any way. The several statutes which do so are quite unsatisfactory and are the subject of constant efforts at repeal or modification.

(5) An important feature of the 1869 model was the inauguration of anti-adulteration legislation. The statute in general terms prohibited intentional adulteration, and charged the board with the duty of appointing experts to investigate suspected cases.

This portion of the statute was very loosely drawn, and would at the present time be regarded as very unsatisfactory.

Restriction of Adulteration.

While many of the pharmacy laws contain provisions relating to adulterations, independent legislation upon the same subject has increased so rapidly within the last decade that this part of the pharmacy law has come to be regarded as of quite minor importance. And as the independent legislation upon the subject of adulteration is likely to be greatly increased in the future, it is undoubtedly best to leave the subject entirely alone in the pharmacy statute, otherwise the pharmacist will find himself the bone of contention between two sets of officials, neither one of whom can be pleased without displeasing the other, and neither of whom can protect him from the prosecutions of the other.

If there were no other legislation upon the subject of food and drug adulteration, it might be very well for the pharmacy laws to include such a provision; but with independent food and drug legislation already adopted in many States, and soon to be adopted in all others, the subject had best be omitted altogether from the statutes regulating the practice of pharmacy.

The foregoing represent those features of the old model which have undergone the greatest modification up to the present time, while the remaining features have been perpetuated at least in substance in nearly all pharmacy legislation since then.

In reading the debate which ensued when the committee presented its report in 1869, the most striking fact which appears is that the pharmacists of that period were not generally agreed as to the necessity of pharmacy laws. The A. Ph. A. then, as now, was fairly representative of the best class of the men interested in pharmacy, and its members were by no means sure that they were in favor of pharmacy legislation in any form. They refused the model their formal approval, and instead adopted a modified report setting forth that the model contained the general principles which might be followed in case the several States should attempt pharmacy legislation. From the debate it appears that the moving argument which secured even this small degree of recognition was that several States would undoubtedly adopt pharmacy lows in the near future, and that the A. Ph. A. model should be preferred as a lesser evil than independent legislation might prove to be.

In this respect the opinions of pharmacists have undergone a very marked change. The man who does not now believe in the necessity of the legal regulation of pharmacy is the exception. Ideas have crystallized, general principles have been established, and we are now prepared to build a new model of tried and tested material, with many assurances of its success with the public and with the profession.

WHAT WERE THE PATENTS SIXTY YEARS AGO?

Patent medicines were, by far, fewer in number, and you could sell a hundred of one kind then more readily than you can sell one of a kind now. Among the patent medicines sold in those days were Dalby's Carminative, Godfrey's Cordial, Lee's Pills, Dean's Rheumatic Pills, Turlington's Balsam in small bottles at $1 per bottle. The bitters were Holman's, Richardson's Sherry Wine, Oxygenated, and Langley's. Cough medicines were Bryan's Pulmonic Wafers, Devine's Pitch Lozenges, and Larookah's Pulmonic Syrup. Ointments: Kitridge's Nerve and Bone Ointment, Hacker's Salve, Tanner's German Salve, Wheaton's Itch Ointment, Reed's Crimenean Ointment. Cosmetics: Balm of a Thousand Flowers, Meenfun, Persian Balm. Miscellaneous: Biokrene, DeGrath's Oil, Dyer's Healing Embrocation, Flagg's Balm of Excellence, Kellinger's Liniment, Ware's Lotion, Sturgis' Electric Oil, Mrs. Krader's Cordial, and Harrison's Peristaltic Lozenges. The confectionery we sold was mostly checkerberry and sassafras lozenges at 6¼ cents an ounce.—*Joel E. Orne.—N. E. Drug.*

The Achievements of Chemistry in the Nineteenth Century.

By Frederick J. Wulling, Ph.G.,

Professor of Pharmacy and Dean of the University of Minnesota College of Pharmacy, Minneapolis, Minn.

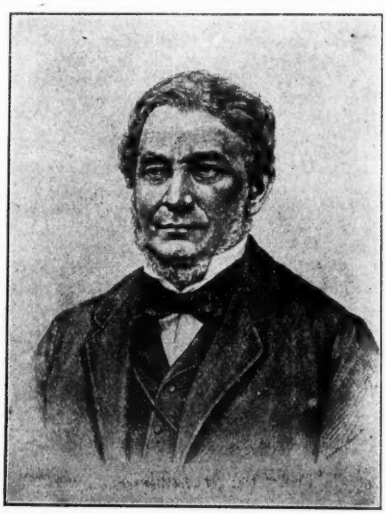
THE achievements of the closing century in the domain of chemistry alone exceed those of all previous centuries. The chief difference between the chemistry of the days of alchemistry and the chemistry of to-day lies in this, that while the former sought to perform a few miracles but did not succeed, the latter in the same pursuit does succeed immensely. Why is it not accounted a miracle when we convert the foul looking coal tar into the iridescent colors of the rainbow ? Because we understand the process. What we understand ceases to be miraculous. Chemistry has outgrown its swaddling clothes of superstition and magic because its laws have permeated into the understanding consciousness of man. The nineteenth century has given man a broad and comprehensive understanding of chemical laws, and man, in the practical application of these laws, has made mighty achievements. The heritage of this century is a tremendous enlightenment, an awakening of the human consciousness to possibilities never before dreamt of. In chemistry and physics more, perhaps, than in other departments of knowledge, the impossible has become possible.

Early Art and Theories.

Although certain chemical facts have been known and understood as far back almost as history goes, the nineteenth century can rightly claim to be the mother of the science of chemistry. While the Chinese, perhaps, thousands of years ago made porcelain, dyes, paper, alloys and, later, gunpowder, borax, sulphur, etc., and the Egyptians made glass and dyestuffs, smelted ores and embalmed bodies, and did other things that justify us in supposing that they had some chemical knowledge, it is more than probable that such knowledge was empirical. The chemical knowledge of the Greeks and Romans was borrowed from the Egyptians and Phœnicians and was not added to. Aristotle's theory of the four elementary conditions of matter—fire, earth, air and water—was unscientific, if anything, and the black art of the Arabs and, later, of the Spanish had less to commend it than Aristotle's theory. The alchemy of the Middle Ages was a groping in the dark with no attempt at system.

An Era Prolific of Discovery.

The first indications of real science became apparent in the latter part of the seventeenth century, when Stahl published his theory of Phlogiston, based upon the speculations of Becher. Radiance was added to this germ of light during the eighteenth century. In 1718 Geoffrey published the first table of affinities; in 1832 Boerhave suggested the chemical relation between heat and light and also overthrew many of the notions of the alchemists. In 1724 and in 1756 Black made discoveries regarding gaseous bodies, especially carbonic acid gas, which was shown to be produced during fermentation and to be found fixed in chalk, etc. Marggraf, about 1755, added alumina and magnesia to the two other known earths, lime and silica. He also demonstrated the occurrence of sugar in plants and extracted it. In 1774 Priestley discovered oxygen, and, a few years before, ammonia and hydrochloric and sulphurous acid gases. About this time and later Sheele discovered oxygen, hydrofluoric and prussic acids, tartaric and gallic acids, and also prepared phosphoric acid from bones. Bergman, about this time, extended the knowledge of analytical



R. W. E Bunsen.

chemistry, and Cavendish discovered hydrogen and made contributions to the knowledge of the gases. In 1770 and during the next twenty or twenty-five years Lavoisier gathered all or nearly all then known chemical facts and founded a system which was universally adopted by chemists. He chiefly was instrumental in the overthrow of the theory of Phlogiston. Before the close of the eighteenth century Fourcroy and Vauquelin made researches that gave an impetus to the study of organic chemistry; Klaproth contributed to the knowledge of inorganic chemistry, and Richter promulgated the doctrine of combining proportions.

The Attraction of the Study.

Thus, at the end of the eighteenth century, we find a number of chemical facts well established and organized into a semblance of legitimate science, and many false doctrines and theories disproved. To the few foundation stones laid during the latter half of the eighteenth century in the structure of the science of chemistry many were added during the first half of the present century. Scientists were attracted to the field of research and discovery, and we have only to read of the works of such as Berzelius, Gay-Lussac, Dalton, Brand, Thenard, Davy, to become imbued with the same enthusiasm that was shared by the chemists of the time, for chemistry began to engross the minds of scientists the civilized world over.

Notable Achievements.

It is not possible to enumerate all of the achievements of the early decades of this century, but among the notable ones we find, first, the perfection of Richter's doctrine of combining proportions. Dalton's atomic theory was formulated in 1808, when he also announced the law of definite chemical proportion and of multiple proportion. Innumerable discoveries based on these laws followed quickly. Dalton's further work on the expansion of gases, the relation of mixed gases, the elasticity of steam and evaporation, etc., were later extended by Wollaston.

Perhaps the first diversification occurred in 1812, when Brand actively began the study of animal chemistry, or the chemistry of physiology. While Gay-Lussac was engaged in work which corroborated Dalton's theory, Sir H. Davy began the development of electrochemistry, resulting quickly in the discovery of sodium and potassium through the decomposition of soda and potassa by the electric current. He introduced the idea that all acids contain hydrogen; this was in opposition to Lavoisier's doctrine that all acids contain oxygen. Davy also opened up the field of agricultural chemistry and was the first to suggest the application of chemistry to industrial processes.

The Work of Berzelius

up to 1808 was so prodigious that it exceeded the accomplishments of any other one chemist. His chief work was in the field of analytical chemistry, but his binary system was opposed by Dumas, in 1832, who substituted a system which carried out Dalton's atomic theory to its logical extent, lending to the then known chemistry a more systematic aspect.

Faraday's Discovery of Benzine

and his researches with compounds of carbon and chlorine, together with the liquefaction of chlorine and other gases, and his work, like Davy's in electrochemistry, were important links in the chain of development.

Wohler's Synthesis of Urea.

The doctrine of isomerism, originated by Faraday, and promulgated by Mistcherlich, and which led to the discovery by the latter of the laws of isomorphism and of dimorphism, stimulated many to take up this field of research.

One of the most important discoveries, if not the foremost, during the century was Wöhler's synthesis of urea, in 1828. The discovery revolutionized the ideas of chemists with regard to organic chemistry.

Space will not allow the enumeration of what was accomplished in organic synthesis during the following years. The doctrine of substitution took the

chemists by storm, and the labors of Liebig, Hofman, Berzelius, Dumas, Laurant, Cahones, Frankland and others soon resulted in the production of a vast number of new compounds and in a clearer knowledge of the structure of many hitherto unknown organic compounds.

Beginnings of the Coal Tar Industry.

The extension of the study of organic chemistry into the domain of practical chemistry resulted in some of the most marvelous discoveries of the century. The year 1858 marks the beginning of the enormous chemical industry, the production of coal tar colors. It was in this year that Perkin patented the dyestuff, anilin violet, though anilin had been isolated from coal tar by Runge as early as 1837 under the name kyanol. The natural coloring matters were soon supplanted by the artificial dyes.

Berthelot's Experiments.

The students of synthetic chemistry soon began to cast their eyes upon the possibilities of the synthesis of food stuffs, and they have succeeded to a marked degree. Berthelot's recent experiments have been marvelous and he has proven conclusively that anything, from eggs to beefsteak, can be produced in the laboratory. It might be interesting to read what Berthelot says with regard to these revolutionary discoveries: "One must," he says, "consider the long evolution which has characterized the development of foods and the major part which chemistry has played therein. The point is that from the earliest time we have steadily increased our reliance upon chemistry in food production, and just as steadily diminished our reliance upon nature. Primitive man ate food and vegetables raw. When he began to cook, when he first began to use fire, chemistry made its first intrusion upon the sphere of nature. To-day the fire in the open air has been replaced by the kitchen. Every cooking utensil now used represents some one of the chemical arts. Stoves, saucepans and pottery are the results of chemical industries. So also modern cookery uses an infinite number of compounds—food compounds—which, like sugar, for instance, have been treated to a more or less complex chemical treatment in their journey from the field, in which they grew, to the kitchen, in which they are used. The ultimate result is clear. Chemistry has furnished the utensils, it has prepared the foods, and now it only remains for chemistry to make the foods themselves, which, indeed, it has already begun to do."

What Chemistry Has Done for Pharmacy and Medicine.

To comprehend what chemistry has done for pharmacy and medicine we need only note a few examples, such as the discovery of chloroform and carbolic acid, the isolation of quinine, morphine, strychnine and the many other alkaloids and glucosides, a number of which have been made in the laboratory, and the production of such synthetic remedies as antipyrin, phenacetin, sulphonal, etc. The synthetic production of many volatile oils and compound ethers, for example, rose, sassafras, wintergreen oils, banana, pear, pineapple, raspberry and a great number of other essences and of such substances as tartaric, citric, lactic and salicylic acids, turpentine, musk, etc., points to greater possibilities.

Allotropism in Nature.

The discovery of several remarkable examples of allotropism has prompted chemists to cease somewhat to ridicule the aspirations of the alchemists, for the discovery strongly suggests the possibility of the realization of the dreams of these philosophers. It has been known for some time that the diamond, charcoal and graphite are chemically identical, but chemists did not begin research in this direction until the discovery of allotropic oxygen, ozone, and of red phosphorus, and it was not until 1888 that Frémy and Verneuil produced rubies artificially, similar in all respects to the natural ones and large enough to be set in jewelry. Within the past three years Moissau produced diamonds artificially, although too small to be of commercial value.

The Utilization of Waste.

One of the remarkable functions of modern chemistry is the utilization of waste: the worthless coal tar now yields the many coloring and dyestuffs; cotton seed, for a long time the bane of the plantation, is now converted into valuable oil, fertilizer and fuel; sawdust and shavings are now mixed with refuse mineral matter and pressed into light, impervious and fire proof brick; coal dust is now mixed with pitch and made into bricks that burn with intense heat and leave no ashes; the refuse of tanneries and slaughter houses yields gelatine and glue; the waste carbonic acid of breweries is liquefied for commercial purposes; the refuse slag of puddling furnaces is powdered and used in paints.

Discovery of the Elements.

The elements discovered during the century are also an indication of chemistry's progress:

In 1860, rubidium and caesium, by Bunsen.

In 1862, thallium, by Crookes.

In 1863, indium, by Reich and Richter.

In 1879, samarium, by Boisbaudran; scandium, by Nilson; thulium, by Cleve.

In 1885, neodymium and praseodymium, by Welsbach.

In 1886, gadolinium, by Marignac, and germanium, by Winkler.

In 1894, argon by Ramsay and Rayleigh.

In 1895, helium, by Ramsay.

In 1896, lucium.

In 1898, krypton, neon and metargon, by Ramsay and Travers; ætherion, by Brush.

Many gases were liquefied during the past decade, such as CO_2, SO_2 oxygen, ozone, hydrogen, helium. Fluorine resisted isolation until 1897, when Moissan succeeded with the electric furnace in separating it.

With these tremendous achievements of modern chemistry, who will venture to predict what the coming century will bring? Specialization is going on so rapiuly and new fields are being explored by such numbers of chemists that we of to-day could probably not comprehend the achievements of the twentieth century could we return to earth in a hundred years.

The Liquefaction of Gases.

The first systematic work in this field was done by Michael Faraday, during the first years of the present century, this line of work having been suggested to him by Humphrey Davy, whose assistant he was. The results of his first experiments were published in 1823. The method which he adopted was to heat in one end of a bent glass tube, sealed at both ends, some solid substance which evolved the gas under investigation. Under these conditions considerable pressure was developed, due to evolution of a large amount of the gas. This gas was cooled by the immersion of the opposite end of the tube in a freezing mixture of ice and salt. By this method Faraday succeeded in liquefying chlorine, sulphurous acid, hydrogen sulphide, carbonic acid gas, nitrous oxide, cyanogen and ammonia.

Up to 1877 all attempts to liquefy air, carbon monoxide, hydrogen, oxygen and nitrogen had failed, although all the investigators naturally attempted their liquefaction. Faraday in his recent investigation writes that the original object of his pursuit was to effect the condensation of oxygen, hydrogen or nitrogen. These gases, therefore, gradually became known as the "permanent" gas, the term implying that they could not be liquefied. That the term was an erroneous one was first shown at the meeting of the French Academy on December 24, 1877, when two communications were read, one from Cailletet at Chatillon-sur-Seine, announcing that "I have just this day liquefied oxygen and carbon monoxide," and one from Pictet, in Geneva, with the statement: "To-day I liquefied oxygen at a pressure of 320 atmospheres and a temperature of —140° C., obtained by means of liquid sulphurous and carbonic acids."

These results naturally stimulated anew investigations in this field, and important discoveries followed. Cailletet soon liquefied nitrogen and air—although his experiments with hydrogen were not successful, only a fine mist being formed. Prominent among the recent investigators must be mentioned the names of Wroblewski, Olszewski and Dewar, to whom we are indebted for many improvements in the apparatus employed. To Dewar must be given the credit for liquefying the two most difficultly condensable gases—viz., hydrogen and helium, and obtaining them in a static condition. This was accomplished in 1898, while during the last year he finally succeeded in obtaining hydrogen in a solid state.

The success which has attended the efforts of Linde, Tripler and others in obtaining liquid air in large quantities has been largely due to the development of the so-called regenerative method. Previously the low temperatures to which the gases were subjected in their liquefaction was obtained by the rapid evaporation of liquid carbonic or sulphurous acids or other liquids of a similar nature. Recently, however, it has been shown that the necessary temperatures may be more effectively reached by simply allowing a part of the condensed gas to expand, whereby the temperature of the remainder is lowered.

The Development of Chemical Synthesis.

By J. W. Wainwright, M.D.

New York City.

We are justified in asserting that whatever our knowledge of physical science may be to-day, it has developed almost entirely during the present century; for previous to 1800 the only branch of science which was intelligently studied, other than mathematics, was astronomy; but astronomy remained passive for still another fifty years, or until the arrival of the spectroscope, which was destined to inform the investigator of the composition of celestial bodies, as the telescope had done of their relative positions, movements and numbers. The study of mechanics; of heat; the arrival of the barometer; the demonstration of the atomic theory, of valence and of substitution; the enunciation of the doctrine of the conservation of energy; the study of fermentation and its products; of bacteria and micro-organisms, with their antitoxins; the application of electricity to science and mechanics, have been mostly within the recollection of man.

Dalton promulgated the atomic theory, upon which the fundamental hypothesis of chemistry was to rest, in 1807. Liebig had made a systematic study of the so-called organic chemistry, which came to be known as the chemistry of compound radicals. Dumas in 1834 made the discovery of the phenomena of substitution, while Dalton unconsciously had foreshadowed chemical synthesis when he stated that "Chemical analysis and synthesis can go no further than to the separation of particles from one another and to *their reunion.*"

No Systematic Work Prior to 1860.

In 1859 Kekule defined organic chemistry as the chemistry of the carbon compounds; while in 1872 Schorlemmer characterized organic chemistry as the chemistry of the hydrocarbons and their derivatives. Previous to 1860 no systematic research had been attempted in the building up of compounds of carbon which were chemically identical with natural organic compounds, by synthesis, notwithstanding the discoveries of Faraday in 1825, Hennell in 1826, and the accidental discovery of Wöhler in 1828, followed by the synthesis of acetic acid in 1845 by Kolba in the action of chlorine upon carbon disulphide.

"But One Chemistry."

Berthelot saw the possibilities and demonstrated the identity of products obtained by synthesis with those of animal and vegetable origin by employing carbon obtained from barium carbonate. This was made to pass successfully through the forms of carbonic oxide, formic acid, barium formate, ethylene, ethylene bromide, ethylene again, and, finally, into ethyl sulphuric acid and its crystallized barium salt, from which alcohol was generated, water and carbon dioxide being the only compounds from which the elements of this alcohol were derived. Thus was it conclusively proven that there is but one chemistry; that there can be no distinction which can be intelligently comprehended as between inorganic and organic chemistry. Even in the study of metallic or mineral compounds we can trace the homologous series between the atomic weight of the elements and their properties. This distinction formerly drawn between chemical individuals of the organic kingdom and those of the mineral kingdom—that while the latter could be prepared artificially, the former were incapable of artificial synthesis—was rudely brushed aside when Wöhler transformed ammonia cyanate into urea, a substance of well defined basic properties which had hitherto been obtained solely from urine and other products of the animal kingdom. So, in the distinction which it had been sought to make between vegetable alkaloids and animal bases, it was for convenience of classification and description, and not because of a distinct difference in properties or constitutions.

The Series of Organic Chemistry.

Four elements, carbon, oxygen, hydrogen and nitrogen, in different atomic relations and proportions, are known to form the whole series of organic chemistry; carbon and hydrogen in all organic bodies, oxygen in most, nitrogen in many, some consisting only of carbon, hydrogen and nitrogen. Carbon yields more compounds than all the other elements taken together; its atoms have the property of combining with one another, while in a chain of carbon atoms all the free combining units can be saturated with hydrogen; from these combinations we derive all the other compounds by the replacement of the hydrogen with other elements. Thus it is that organic chemistry has been denoted the chemistry of the hydrocarbons and their derivatives. Liebig attacked Dumas because he declared that carbon in organic substances could be replaced, but this law of substitution prevailed, and the important discovery made by Dumas led up to that of a reverse substitution, the production of the original body from the substitution product. Both Berzelius and Gmelin in 1817 declared that while inorganic compounds could be built up from their elements, organic bodies could not be artificially produced, stating that the elements in the living structure obeyed totally different laws from those which regulate the formation of compounds belonging to the inanimate world. Berzelius believed that bodies occuring in nature could be converted into other organic compounds by chemical decomposition, but denied that they could be built up from their elements. We now know, however, that as soon as the constitution of a product of the organic world is accurately determined, we may safely declare that it is susceptible of artificial or synthetic preparation.

Progress in Synthesis.

Since Berthelot, chemical synthesis has made steady and rapid advancement. We now make the simpler materials, such as formic and acetic acid, in the laboratory, as well as the complex vegetable acids: tartaric, citric, salicylic, gallic, cinnamic, and not only ethylic alcohol, but phenols, indigo, alizarin, sugars and alkaloids identical with those from plants.

The Synthesis of Indigo

is one of the most interesting. During the fermentation necessary to obtain indigo, a green is first developed, then the blue liquid, which, upon exposure to the air, becomes oxidized, when indigo is precipitated. If we reduce a portion of indigo to indigo-white by the action of zinc filings and caustic soda, and expose this colorless liquid to the air, we will have the intense blue known as indigo-blue. Why the compound C_{16} H_{12} N_2 O_2, which is colorless, upon exposure to the atmosphere for a short time, or long enough to part with two atoms of hydrogen, should become so intensely blue, is, together with other like phenomena of color absorption, one of great commercial interest as well as of scientific study. That the great variety of colors and shades should be produceable from combinations and arrangements of carbon, hydrogen, nitrogen and oxygen, colorless gases, can be explained only upon the theory of selective color absorption, or affinity of certain molecular configurations for individual rays of light, causing them to absorb vibrations of different wave lengths.

The Study of the Aromatic Compounds.

Faraday in 1825 obtained from coal gas a liquid which he called "bicarbureted hydrogen" (aniline). This same substance was obtained later from the dry distillation of benzoic acid with lime. It was not suspected that this oily substance would later revolutionize both science and art; that an industry would be built up out of its products that would furnish employment for thousands of workmen, and materials whose annual value would reach prodigious amounts, and all this was to come through the studies of the constitution of the aromatic compounds and the fatty series by Kékulé.

The Discovery of Alizarine.

In 1868 Graebe and Liebermann established the relation of alizarine to anthracene, a hydrocarbon present in coal tar oil. Upon this discovery the large commercial industry of the cultivating of the madder plant was turned into chaos, and millions of money with thousands of individuals were made to seek new fields of investment and employment. Alizarine treated with mordants exhibits bright and characteristic colors dependent upon the mordants employed. In this manner are produced the aniline dyes. This tinctorial power is another incomprehensible mystery. Why substances so diverse in composition should show the selective power of light absorption is not known.

The Array of Synthetic Remedies.

Synthetic chemistry has furnished us with a bewildering number of new agents, not alone medicinal products, antiseptics, anesthetics, analgesics, hypnotics, reconstituents, antitoxins, and, in fact, remedies applicable to all forms of disease, but explosives, such as nitroglycerin and guncotton. Further, it furnishes us with illuminating oils and

gases, perfumes, substitutes for india-rubber, ivory, parchment, etc., to say nothing of the products of fermentation.

The Chemistry of Fermentation.

Putrefaction is a kind of fermentation of nitrogenous organic matter, more especially the proteids, and this change is brought about always by the action of bacteria or micro-organisms. During this fermentation and the succeeding putrefaction certain chemical changes occur, and we have resulting synthetically prepared chemical substances identical with the vegetable alkaloids, some of which are extremely toxic. Brieger states that the same species of bacteria give different products, according to the soil in which they are cultivated. Neurine is the principal ptomain produced in the fermentation of the flesh of mammals, while in putrefying fish he found a base with the same composition and physiological action as muscarin. Cheese yielded neuridin, while glue yielded neuridin and a base very closely allied to muscarin. Gautier attempted to draw a distinction between the products of the action of bacteria or proteid matter and those due to bio-chemical and physiological activity in the living tissues. While defining ptomains as products of bacterial fermentation or putrefaction, the leucomains were thought to result from normal or abnormal decomposition of the living body. But so sharp a distinction cannot be drawn, for we know that certain animal bases are products of both kinds of decomposition.

Pathological Products.

In the excretions of those suffering from suppurative wounds there is found quantities of phenol, which is known as a most active germicide. Here we have a product of putrefaction which is itself highly destructive to all forms of bacteria and micro-organisms, and we are left to wonder if this product be not one of nature's agents, formed in a substance, and at a time when needed to assist in the correction of a pathological condition whose continuance without some such agency would result in general destruction. There is in the evacuations of those suffering from typhoid fever traces of a base which dilates the pupil, produces diarrhea, and is rapidly fatal to animal life. Certain of these bases resulting from putrefaction are violently poisonous.

The Stages of Putrefaction.

Putrefactive decomposition begins by the transformation of the proteid substance itself, first, into albuminates, or bodies soluble in liquids of either acid or alkaline reaction, but precipitated on neutralization; secondly, into peptones, soluble at all temperatures and in all aqueous liquids, whether acid, alkaline or neutral. The second stage of putrefaction consists in the breaking up of these proteid bodies, forming compounds of comparatively simple and definite composition, of which the principals are tryosin, leucin and indole. The tryosin and indole belong to the aromatic series, the members of which usually possess more or less antiseptic properties, or which are antagonistic to the life of micro-organisms. In the putrefactive process the initial material is proteid, and in the end, ammonia and carbon dioxide; so that the difference between putrefactive changes and the normal decomposition which occurs in the living animal (both processes being that of chemical synthesis) are chiefly in the intermediate stages, the formation of glucosides of fatty acids being especially characteristic of living processes, while the production of amido-derivatives of the lower fatty acids characterizes putrefactive decomposition. The properties of these and similar compounds depend upon the arrangement of their parts rather than upon a special nature. Variations in molecular arrangements do not come as the result of chance, atoms are not jumbled together. The laws of valency and selection are potent forces. So long as a compound retains its identity its constituent atoms do not wander about, but if a change of relative position does occur from any influence we will have at once a change in chemical character of the compound.

Progress of Chemical Materia Medica.

Until recent years the therapeutist was forced to depend upon drugs of known medicinal value of vegetable origin. This condition has largely changed, and the change has been brought about by the technical chemist. It is he who now prepares the therapeutic agents mostly used, and this has come about as a result of a better understanding of modern chemistry, especially synthetic chemistry. A few years since the chemist gave his energies to attempts to isolate active principles of medicinal drugs, and progress was made; but progress now turns to the laboratory of the pharmaceutical chemist, where chloroform, chloral hydrate, salicylic acid, first came to light, and from there the laboratory of the physiological chemist, who is alone able to scientifically study the pharmacodynamics of remedial agents. The introduction of chloroform, chloral hydrate and salicylic acid did not awaken much interest in technical chemistry. It was not until Donath in 1881 demonstrated the similarity between chinolin (a synthetic product) and its derivatives to quinine in its physiological action that attention was directed to the possibilities of synthesis in medicinal products. Fischer followed with kairin; then came Knorr with antipyrine, which was shown to have decided antipyretic properties by Filehné. These were followed in rapid succession by thallin, acetanilid, phenacetin and the innumerable substitutes for iodoform. The success attending the introduction of some of these products and the profits accruing led to the introduction of a great many remedies, in many cases with insufficient and in some cases without clinical tests.

Mysteries Yet to Master.

We see that the study of organic chemistry—erroneously denominated—concerns the great question as to the source and distribution of energy in nature as well as the origin and operations of life. When we can discover—and what man of science doubts that we will yet discover—why the same atoms of carbon, hydrogen and oxygen in the same and identical proportions will at one time constitute starch and at another cotton; why the sugar obtained from honey should be composed of the same atoms and in the same proportions as constitute also lactic acid; or, again, why the molecule consisting of sixteen atoms of carbon and two of nitrogen should furnish the coloring matter of indigo; why inodorous elements in exact proportions should furnish the scents identical to those of flowers; when we can discover why molecular rearrangement of certain atoms should alone be the cause of electric force; why so slight a variation in the relative position of molecules will, with the same elements, furnish products of such varying character and properties; when we shall comprehend these and other mysteries of chemical synthesis, we shall have obtained a knowledge of nature's laws which will indeed make us masters of creation. With such achievements behind us and the prodigious advance in chemical science as is witnessed—one is tempted to say daily—coupled with the all-prevailing spirit of investigation, who is willing to say that we may not yet turn aside the veil of mystery and view the formation of life itself; already the ear is so attuned, the understanding so acute, that whisperings may be heard by those near the entrance to life's workshop. That mankind will be lifted to higher and more exalted intelligence and benefit by this knowledge is certain.

Export Trade in Drugs.

By John McKesson, Jr.,

New York City.

American indigenous drugs have been increasing in demand in Europe in the last decade, and their popularity may be attributed to the fact that American citizens traveling and residing abroad have created the demand and called attention to their efficacy in various diseases; but one hundred years ago the export trade in drugs and chemicals was nil.

With regard to proprietary medicines, many of the successful manufacturers have found a good field to work in abroad, and their advertisements may be found printed in many languages. South and Central America have long been the best worked fields, but Brazil has tried to put a check upon the business by requiring the publication of all formulas, and quite recently Buenos Ayres has adopted the same course. The effect of this measure is to necessitate a branch factory to be established within the borders of these countries. Probably cotton seed oil, which should be classed as a pharmaceutical, is the largest exported article in that line. In this country we have seen articles like castor oil drop from the importation list and, to some extent, enter that of exports. English and Japan peppermint oil are no longer brought here, but many thousand pounds produced here are consumed abroad.

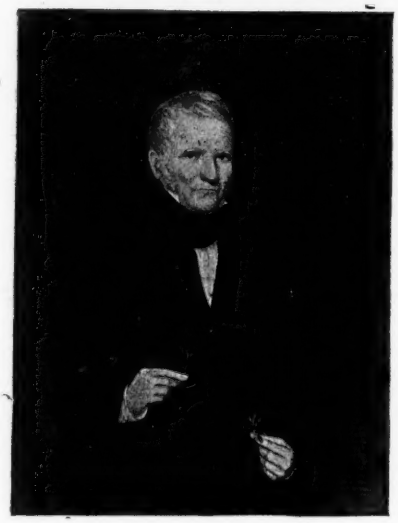
Materia Medica Americana—A Historical Review.

By Prof. John Uri Lloyd,

Cincinnati, O.

THE history of American drugs is that of a struggle for and against authority. On the one side is to be seen the systematic physician with his cherished remedies and methods heired from the past, on the other hand is found the irregular or liberal who was his opponent and antagonist. This war, for war it was, bitter, vicious, unrelenting, led good men engaged in a humanitarian cause to neglect and oppose kindly methods of medication and led them also to decline to use American drugs that, but for these professional antagonisms, might have been broadly introduced at the beginning of the nineteenth century instead of at the close.

We are now far enough away from the actors concerned in the drama that



Samuel Thomson.

marks the struggle relative to the introduction of American drugs to perceive the aims, the antagonisms, the trials of these people, as well as the objects, ambitions and hopes of those concerned in upholding the profession of medicine, and preventing its contamination with illiteracy, with which the opposition was more or less broadly charged.

Early Prejudices.

We can now be charitable to both parties, to all parties, for much partisanship that now makes curious history was concerned in the bitter personalities that for seventy-five years, beginning with the nineteenth century, involved the persons concerned in American medicine. Pass, then, with a kindly thought the harsh words; pass the intense interest of the participants; pass the bitterness that resulted; let us be "gentle toward prejudices that no longer bite," for it can now be seen that these are but evidences of the fact that the men involved therein were human.

Beginnings of History.

The history of American drugs dates from the sixteenth century, although with a few exceptions but little commercial importance was attached to such American products until after the year 1800.

Sassafras,

as has been recorded by the author[1], assumed importance as early as the year 1512-1574, and was even exported by the cargo to Europe, vessels being sent to America expressly for that drug. But, aside from sassafras and tobacco, this part of the New World (excepting the dyestuffs, spices and similar products of the tropical islands), was unimportant as a drug producer.

Lobelia

flashed into conspicuity with the notoriety of Samuel Thomson about 1815,[2] but by reason of Thomson's methods was considered a "quack medicine." Senega and serpentaria crept into some repute, ginseng became an article of demand, and a few of the substances named in Barton's Collections (1798 and 1804) were articles of mere domestic importance. But, owing largely to the fact that the medical profession of America was taught from English textbooks and was expected to use drugs that were authorized by English authorities, it was not considered in good form, but rather the contrary, to employ medicinal substances of irregular origin.

Even such talented men as Dr. Bigelow, B. S. Barton and the influence of the many excellent theses that emanated from the graduates of the University of Pennsylvania under the direction of himself and his nephew, W. P. C. Barton, the early part of the nineteenth century, were of little moment; America looked still to Europe for light concerning both medicine and therapy, and not to do so was audacious in the eyes of authority.

American Works on Materia Medica.

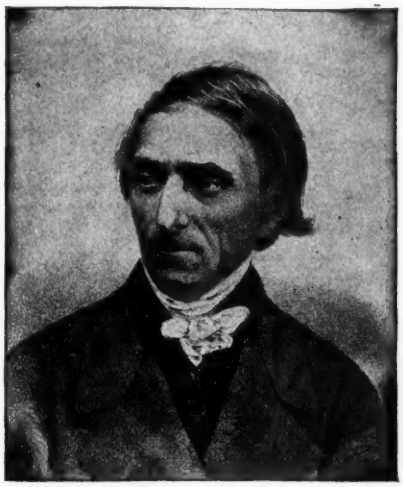
Then came the Massachusetts Pharmacopœia (1808), Dyckman's American edition of the Edinburgh Dispensatory (1818), Coxe's Dispensatory (1820), Bigelow's Materia Medica (1817-1820) and Sequel to the U. S. P. (1822), Eberle's Materia Medica (1824), the Materia Medica of Zollickoffer (1826), the works of Thacher and of Rafinesque (1828-1830), the first edition of the United States Dispensatory (1833), the Materia Medica of Tully (1857), and other regular works of a similar nature, all to little avail so far as introducing American medicinal products into the practice of the regular profession were concerned, although Zollickoffer, Thatcher and a few others gave particular attention to some of the indigenous remedies. Indeed a scrutiny of the Edinburgh New Dispensatory (1796) and Quincy's Dispensatory (of similar date), and a comparison therewith of the American works on materia medica that appeared in the early part of this century, demonstrates that at that time few drugs of American origin other than those authorized from Europe were given a position in the American works.

[1] Western Druggist and American Druggist, 1898.

[2] Thomson claimed to have discovered its virtues in 1773, when but a child. "Life and Medical Discoveries of Samuel Thomson," tenth edition, p. 16.

The Origin of Eclecticism.

At last Wooster Beach and the irregulars who contended against the domina-



Wooster Beach

tion of European rule as applied longer to American physicians, thrust themselves forward. Seizing on the neglected works of all who preceded him, seeking also the aid of domestic medicine, and appealing to the people as had Thomson, he wrote his "Beach's American Practice" (1833), and became the champion of American medication, aiming whenever possible to use American drugs instead of those from abroad. And this unorganized effort of Beach and other irregulars gave rise to Eclecticism,

Benjamin Smith Barton.

a great factor in the record made by the American drugs, for John King, the friend of Beach, was the one to organize the eclectic school, and is called the father of eclecticism. As Beach went out King came in, and (1852) from his pen came the Eclectic Dispensatory, which was irregular in the extreme in that it made conspicuous numbers of

formulas not found in any European dispensatory, and also cited uses for numbers of American drugs previously deemed unimportant or the exclusive property of quacks. Such in brief is the general history of the American Materia Medica ,the first important number being sassafras (1512) and the last, to date, Echinacea angustifolia (1885).

Men and Firms Who Pushed American Drugs.

But the record made by our drugs is not confined to books, nor is it by any means due to the efforts of physicians who as purely professional men are not concerned in broadening the use of this or that remedy. The pharmacist comes in for a great share of the credit due to the exploiting of remedial agents. Watching the signs, the druggist, for his province is business, advertised to the medical profession at large the remedies established as useful by the few, and thus, in my opinion, the pharmacist has been largely instrumental in bring-

JOHN KING.

ing to the attention of the medical profession the American drugs used in medicine. The first record I can find of a pharmacist having thus served the profession by pushing a drug was that of George W. Carpenter (1831), in his "Essays on Some of the Most Important Articles of the Materia Medica," in which he used the name of the "faculty" of the University of Pennsylvania, and dedicated his re- same institution. This was followed by the efforts of such men and firms as Wm. S. Merrell & Co., B. Keith & Co., Tilden & Co., Thayer & Co., Sharp & Dohme, Parke, Davis & Co., Frederick Stearns & Co., Eli Lilly & Co., Allaire, Woodward & Co., Burroughs Bros., and others. Watchful of the best remedies, for no reputable firm can afford to connect its name with anything inferior, drug houses and manufacturing chemists through their advertisements gradually pushed into conspicuity the irregular remedies that became recognized finally as valuable the world over. Pushed is the right term, for their uses were often extended by force because of the prejudice or indifference of regular physicians or because of the desire to conform to authority which led them to prefer the old until the new came to them with European sanction.

The Recognition of Eclectic Remedies.

Thus it was that one by one the drugs, lobelia, podophyllum, leptandra, sanguinaria, hydrastis, iris versicolor, cimicifuga, rhamnus purshiana, echinacea and a host of others, often after being long used by irregulars (Eclectics, Thomsonians and Homœopaths), came into repute with the regular school and crept into the pharmacopœia.

The Part Played by the Shakers of Lebanon.

But in thus briefly considering the general history of American drugs I must not neglect to credit the Shakers of the many Lebanon villages with their part. Fifty years ago this peaceable, industrious, honorable sect was a great factor both in collecting and in cultivating medicinal drugs. They were among the first to press authentic herbs of fine quality into packages, they made solid extracts for the trade, and they even prepared certain decoctions for the use of the people. And it must not be omitted that at one time Tilden & Co., of New York, devoted much attention to a botanical garden in which they raised drugs for their great laboratory, at that time the most extensive in America.

The Fight for Recognition.

Such in brief is the history of American drugs, which may be summed up as follows: Many of those most valuable were introduced into domestic practice, came thereby to the attention of such physicians as Barton, were recorded and then neglected until revived by Beach and the Eclectics. Many others were discovered or utilized by Samuel Thomson and his followers, and, by reason of that fact, were either antagonized or neglected by the regular profession. A few were accepted as worthy and were accorded positions in regular works, especially those that had obtained European recognition, senega, serpentaria, sassafras and spigelia being the important members of the few so honored.

Looking Backward.

But as we look back over the field from which most of the personal animosities and rivalries that possessed the actors have passed away, together with the men who were concerned, we can perceive that nature was following the usual course in resisting innovations on methods established by custom and authority. Opposition and indifference to that which is new or different from established custom comes as naturally to persons engaged in medicine as to those in art and in literature. Rules, right or wrong, established by authority bind the majority like bands of steel. The persecution of Samuel Thomson, or the oppression and ignominy cast on the early eclectics who aimed to do no greater wrong than to seek to replace harsh methods in medicine by means of those more kindly, and whose ambition was to supplant European remedies with those produced in America, was as natural as life, for the record shows that it was a part of life.

BENEDICT ARNOLD.

An Historic Druggist.

BY WM. ABBATT,

New York City.

THE best-known American that ever sold drugs was a Connecticut man who never wrote upon pharmacy, attended a druggists' convention, sold a glass of soda water, or so much as heard of bacteria or a host of other things the modern pharmacist knows all about.

Druggist—Soldier—Traitor.

Yet his name is as familiar to the world as is Washington's—though for a very different reason. Not because he was a druggist, but a soldier of acknowledged capacity and success—and, alas, also a traitor. For a million who know of Benedict Arnold the traitor, perhaps ten know of Arnold the druggist; but as the would-be betrayer of West Point he is, as Irving says, "sadly conspicuous to the end of time."

Born in Norwich, Conn., January 14, 1741, he barely entered the nineteenth century, dying in London, June 14, 1801. The family were of the best Rhode Island stock, where his great grandfather was repeatedly Governor, and his father, Captain Benedict, was a substantial and honored citizen of Norwich.

His Apprenticeship in Pharmacy.

The story of young Arnold's adventurous boyhood is a part of our history, but few know that he who was to play so prominent a part in the drama of '76 was bred to the peaceful occupation of a druggist and followed it for a number of years with success. Before he was fifteen years old he was apprenticed to a Norwich firm, the brothers Daniel and Joshua Lathrop, relatives of his mother. Besides keeping a large (for those days) drug store, they were practicing physicians, Daniel, in particular, having completed the study of medicine under the best teachers in London. The firm did a large business, importing their own goods, and young Arnold had an excellent introduction into the trade. The term of apprenticeship was nearly or quite seven years, for he remained with them until he was twenty-one, when, with the enterprise and decision which were to become so prominent in his later years, he determined to start in business for himself. The Lathrops must have been thoroughly convinced of his capacity for success, for they lent him (or gave outright, it is not certain which) $2,000 to establish himself in New Haven. When the comparative purchasing power of money is considered, this is equal to $5,000 at present; and fortunate indeed would a drug clerk of to-day be who could command equal capital on such terms.

His Store in New Haven.

Arnold's store in New Haven, which he opened in 1762, was at the corner of Church and George Streets, but he afterward removed it to an unknown site near his house, which was in Water Street, then not a hundred yards from the harbor. No trace remains of either of the two stores, but the house still stands, although almost destroyed. Its

handsome oak door, mantels and wainscot have been secured for the museums of different colonial and historical societies, and the building itself is now a mere shell, used for a lumber shed, although as late as 1850 it was described as a handsome building, embowered in shrubbery.

A Secret Closet.

Between the ceiling of the third story and the floor of the fourth is a large secret closet, which was very likely used to hide smuggled goods—a proceeding perfectly legitimate in those days (and not unknown even in our own). Handsome in person, attractive in manner, Arnold soon became a figure in the best society of New Haven, and captain of the military organization known as the Governor's Guard. His first wife was a New Haven girl, daughter of Sheriff Mansfield, and her three children were born here. He put out a sign, which is still preserved in New Haven, painted black, with white letters:

B. ARNOLD, DRUGGIST,

Bookseller, &c.,

FROM LONDON.

Sibi Totique.

but soon engaged also in general trade, owning a half interest in three small vessels, in which he imported goods from the West India islands, and, in turn, exported thence cattle, horses and mules. In all his ventures he was successful, and was rapidly becoming rich when the Revolution broke out. His account book, which is now owned by the New Haven Colony Historical Society, shows that he dealt in all the usual drugs of that time, though the list would seem pitifully small when compared with the stock list of a New Haven drug store of to-day. A prominent feature of its yellowed pages is the frequent entries of sales of rum—the ordinary drink at that time. It is mostly New England rum, too, but here and there is an entry showing that some of his better-off customers confined their drinking to the superior article of "West India rum." An entry which shows the trading habit of New England customers is: —— —— "to 1 Qt. N. Eng. Rum. *Per Contra*, By 4 oz. Butter."

The Happiest Period of His Life.

Well would it have been for Arnold had his life ended before 1775, when the druggist, bookseller and general merchant was a man of high reputation, increasing fortune and social distinction. It was the happiest period of his life, and the inventory of his property, made when the outraged Government confiscated it after his treason, foots up £2,400, equal to-day to $37,500. His last visit to the New Haven house was in 1778, when he came to recover from his wound, received at the battle of Saratoga. He was then received by the citizens with much parade and circumstance, and for the next few months the old house was a scene of gayety such as it never witnessed again, and to which its present condition offers a contrast as sad as that between the fortunes of its prosperous and honored druggist-occupant of 1762-70 and his death in London, a lonely, dishonored exile, in 1801.

A RETROSPECT.

By J. W. Colcord,

Lynn, Mass.

As the young man with increasing years looks forward hopefully to the future, picturing to himself victories yet to be achieved, so he of declining years may be pardoned for indulging in retrospective musings. As the youth rarely attains the heights he has aimed to reach, even so the elder, as he casts a look backward upon life's ashes and withered leaves—he not infrequently extracts comfort and satisfaction from the thought of difficulties surmounted and even slight measures of success.

As Æneas, in relating to Dido the story of the defense and sacking of Troy, added force to his story by telling how he was a part of it, so I would modestly claim some part in the efforts that have been made during the past quarter of a century or more to place the business side of pharmacy on a better and more remunerative basis. Have we yet gained the hoped for meed of success? Assuredly, no. To many it would seem as if we had lost, instead of gained, ground. Yet this is not true, since all our efforts have not gone for nothing. We have laid a foundation that our successors may some day build upon. We have made history; perhaps a history of errors, whereby it may be that those who succeed us, yea, perhaps those who have already taken our places, may bring about better things. As the pendulum swings over the same arc from one extreme to the other, never stopping unless time itself ceases to be recorded, let us try if we can discover at which point of the arc we are now located.

An Old-time Apothecary.

Many years ago I succeeded in business to almost the counterpart in personal appearance of the apothecary described by Shakespeare—he who is so often quoted at us on festive occasions, though seldom by us. Like Taddeo Saddi's bridge, celebrated by Longfellow, he was "old, so old." He could remember almost the dawn of pharmacy in our country. He told me of the first appearance in our midst of the strictly proprietary medicines. It was, if I mistake not, an English pill, and was sold in bar rooms, taverns, and in general stores. True, pharmacies, strictly such, were not so common as now, but those that did exist stuck closely to their own trade and would have none of the nostrums. Proprietaries increased slowly but surely in numbers. As drug stores also increased in number they gradually added proprietaries to their stock in trade, and thus laid the foundation for trouble for their descendants. Once more the pendulum seems to be swinging back to its starting point, with the sale of certain proprietary medicines being urged in bar rooms and general stores. As it reaches the perpendicular may it not bring us once more the boon of prosperity? Let us hope so at least.

From the East to the West.

As the operations of the cutter were felt first in the East, particularly around Boston, from whence the evil spread West and South, so the first efforts to withstand the engulfing tide were made there. So far as I know, Essex County, Mass., is entitled to the credit of making the first organized effort in the way of a county association and price list in 1879. Local associations soon sprang into existence in Salem, Lynn, Haverhill, Lawrence and elsewhere. The State association followed as a natural sequence, and the National Retail Druggists' Association (the forerunner of the N. A. R. D.) was founded shortly after. Each had their brief day, albeit some lived for a number of years and went their way, all save the State association, which was not based solely on trade lines. With these various organizations came many attempts to secure full prices on patents. The first one of national moment was that styled the Campion plan, whereby the manufacturer and jobbers were to refuse to supply those who would not sign a contract to sell all proprietary goods at full marked prices. It was a good plan—an ideal plan, I might say—on paper, and it will work some time in the future when trade is based on honesty and the golden rule, instead of selfishness and overreaching —*i. e.*, in the millenium. The reason it met disaster was dollars to doughnuts as between the manufacturer, the jobber and the retailer, although representatives of the several classes shouted to the other *tu quoque*. Some were more ready to preach than to practice. After a few months of battling for life this epitaph was duly inscribed upon its tombstone: "If I was so soon to be done for, What was I so soon begun for." Following its demise appeals were made year after year to the manufacturers and jobbers to extend the protection afforded the jobbers to the retail trade. These appeals were made to the twin national associations. Did our appeals avail aught? Let history answer.

"Codlin's Your Friend, not Short."

It was a case on the part of manufacturers and jobbers of 'Codlin's your friend, not Short!" There is no doubt they fully intended to help the retailer, some time, provided they were not allowed to forget it, but some plan that would be suitable in heaven must be found to be applied on this sinful earth.

Then came the guild with its semi-boycott reversed, that of giving all your trade to the jobber who helped you (or did not get caught in doing otherwise). "Vere is dot barty now?" Perhaps it made a "touch down." I do not know. The Interstate League was its successor and gave promise of being a winner, but—. During the past two years another attempt is being made by the National Association of Retail Druggists along some different lines, the mistakes of the past being avoided. The executive of the latest national organization seems to be working with greater unanimity of action, and are avoiding the greatest fault of all past work—being disunion and lack of harmony. God grant to the N. A. R. D. the highest meed of success all over our land; it has proved successful already in many places, wherever the local forces have been able to eliminate the cutter, though the baleful influence of the one man power has proved too great as yet in too many others.

Lynn, Mass, Feb. 5, 1900.

Some Observations on the Price Cutting Problem.

By M. N. Kline,

Philadelphia, Pa.

NO subject has occupied more space in the pharmaceutical and drug trade journals, nor occupied more time for discussion during both retail and wholesale drug association meetings, than this one of price cutting. Its history is so well known, the various plans proposed for its correction have been so thoroughly considered by every one interested, that it seems almost impossible to suggest anything that is new, and it is certainly not necessary here to refer again to either in detail. Yet when we take into consideration that a very large majority of druggists consider that the very life of the retail drug business depends upon at least some amelioration of this evil, we do not wonder that the topic has as absorbing an interest to-day as it had during the first years when it forced itself upon our attention.

What may be said on this subject can, I think, best be considered under three heads:

First, the cause of price cutting.
Secondly, its effect.
Thirdly, its remedy.

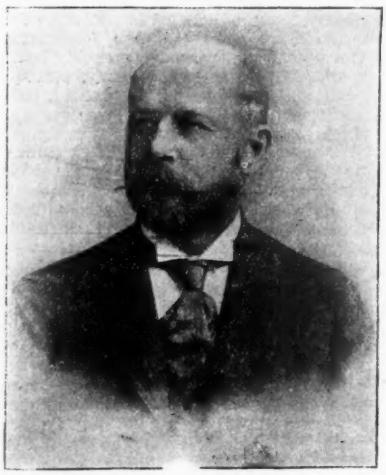
As to Its Cause

I think it may safely be claimed that a very large majority of wholesale and retail druggists now admit that the margin of profit which had been fixed by the manufacturers in their schedule of retail prices, though not too great at first, while proprietary medicines constituted a very small proportion of the sale of medicines in the drug stores, later on, as these sales became larger and larger, and the fact that it required no skill to handle them became known, made it impossible to hold these margins under new conditions. The attention of those anxious to enter some new field of enterprise, who were willing to handle these ready made medicines at what my friend Seabury aptly termed, many years ago, "muslin" margins, was attracted to this and the trouble began. When these outsiders first entered the field, in about 1882, holding out attractive cuts in prices of proprietary medicines, some of the more enterprising and farsighted druggists, who were regularly engaged in the sale of medicines in the larger trade centers, at once realized that "the inevitable was sure to happen," and that the only hope for them to hold their trade on this portion of their business was to meet the prices which the interlopers had published. At that time it will be remembered that a majority of the preparations retailing at 25 cents were being sold to retail dealers at from $1.50 to $1.75 per dozen, and many as low as $1.25 a dozen, 50 cent preparations from $3.50 to $3.75, and $1 preparations from $7 to $7.50, or, at the outside, $8 per dozen. This wide margin then, I think, as before stated, all can see was the chief cause of the beginning of the trouble.

Then

A Contributing Cause,

doubtless, was the effort which some of us seriously made to keep dealers who did not hold to these full prices from procuring supplies of these articles. In the light of subsequent experience, I can see now (though I could not then) that this really helped, rather than hindered, the cutting of prices. I give it as my deliberate judgment, after a careful study of this cut rate practice from its inception to this time, that less trouble would have been experienced in subsequent years if the situation had at once been squarely met, the wide margin of profit on these ready made preparations at once cut in half by the druggists handling them, in which case I feel we would never have reached the acute stage that has characterized it in



Mahlon N. Kline, Philadelphia,
Former Chairman of N. W. D. A. Committee on Proprietary Goods.

many localities since, and characterized it to-day.

Without saying more on this first point, I will refer, under the second heading, to

A Few of Its Effects.

The first effect, which has not yet entirely died out, is a feeling of the intensest hatred by the regular druggist or pharmacist toward those who inauguarated this cut in prices, and this feeling of resentment usually has resulted in a warfare which has brought about a schedule of retail prices that not only does not yield the buyer of average quantities any profit, but which, in many cases, has resulted in selling at an absolute loss, the belief being that by this course those who inaugurated cut rate prices would be driven out of business.

The second effect, and one naturally resulting from the first, has been an active opposition on the part of a large majority of retail druggists to proprietary medicines generally, and this has resulted in what is commonly, though, I think, in many cases, erroneously, called "substitution," which has been disastrous to the manufacturer. It is well known that the cost of creating a demand for any particular proprietary article has been very largely enhanced by reason of this active opposition on the part of many of those who stand next the consumer, and the indifference of the balance. This has brought into successful operation many large manufacturing concerns who provide ready made non-secret remedies, which the retailers can push in place of some of the largely advertised proprietary articles. I am not now discussing the question as to whether the retailer is justified or not in encouraging these manufacturers, but am simply stating a fact well known to all, which I believe to be entirely due to price cutting and to be one of its effects.

Then it undoubtedly has had another effect (which has been beneficial) in developing the capacity of the retailer to originate household remedies of his own and place them upon the market, at least so far as his own immediate constituency was concerned.

Its Most Serious Effect.

While this evolution of the retail drug business has been going on, the principle of "the survival of the fittest" was having its practical application, and inevitable result, and, consequently, large numbers of retail druggists have been financially driven to the wall, and very many are able to continue business only by the sufferance and indulgence of the wholesale houses, who, in many instances very largely furnish the capital upon which they are conducting business. This is its most serious effect.

One of the results which naturally was expected to come about was a material reduction in the number of retail drug stores in cutting centers. It was supposed that as 50 per cent. less of business was, by this price cutting, rendered unprofitable, 50 per cent. less of druggists would survive to continue the business. Statistics show a very small reduction, if any, in proportion to the population, of retail drug stores in existence to-day than were in business in 1883.

Now, in the third place, as to

The Remedy.

It will at once be admitted that if I really knew the solution of the problem, I would retire from the wholesale drug business, take out a patent on my plan and place it upon a royalty basis, with all the manufacturers, wholesalers and retail druggists in this country. As is well known, there have been enterprising individuals who have attempted to foist plans for the purpose of "revenue" and many a druggist has had his confidence betrayed and his precious dollars filched from him by those who had plans which they "knew" would work out a solution of the whole difficulty, but it has generally been found that, after sufficient money has been collected, the originator of the plan quietly disappears or seeks other fields in which he may exercise his wits,

though not his conscience, and the condition of the druggist remains the same. Many of us, however, have given time and effort, without hope of reward, in seeeking to solve the problem, but, as stated at the outstart of this paper, it does not seem much nearer solution than when we first applied ourselves to the task.

Mistakes to be Avoided.

Of one thing, however, we may be sure, and that is, that in any attempt at the amelioration of the condition of the drug trade of this country at this time the mistakes which have been made during the past seventeen years, and herein pointed out, must be fully recognized and must not be repeated by those in charge of national and local organizations. First, they must recognize that as the margin between wholesale and retail price was too great to be successfully maintained, they must not in any of the plans attempt the impossible task of holding full market prices in large trade centers. In the next place, as "war always means waste," and experience has proven that the warfare upon what are known as "cutters" has not resulted, in any case, so far as I have known, satisfactorily, they must not undertake the adoption of schedules by fighting those who do not at first agree to them. In the third place, as the retail druggist or pharmacist has the undoubted right to originate, prepare and advertise household remedies of his own, they must not undertake to force or influence him to abrogate this right, in favor of largely advertised proprietary remedies.

In response to a request for some account of the history of the various plans adopted for the regulation of prices on proprietaries, Mr. Kline contributes the following:

The first plan that was taken up through any concerted action was what is known as the Campion Plan, which was put in operation some time in 1883, with headquarters in Philadelphia. This plan was an attempt by about twenty of the leading proprietors to enforce full schedules on their preparations, and to prevent all druggists who would not adhere to these schedules from obtaining and handling their articles. The effort was kept up for about a year and a half, when those who had to do with it realized that it was impossible to control supplies, and it was given up.

The next in order was

The Tripartite Agreement,

which was in charge of a committee of nine; three appointed by the manufacturers, three by the wholesalers and three by the retailers. This committee made various recommendations, and had the co-operation of a very large number of manufacturers, and practically all the wholesale houses in the country, but still none of the plans proposed proved effective.

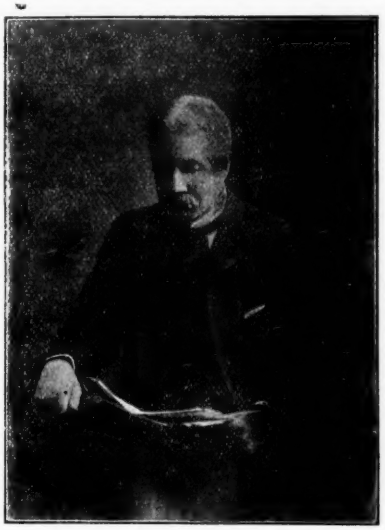
The Hood Plan.

Then an individual effort was made by Hood to keep his sarsaparilla out of the hands of dealers who would not adhere to his minimum price of 80 cents. This plan had much of practical common sense back of it, but unfortunately the retail trade was not ready for a compromise price and jumped on it unmercifully, and practically forced Mr. Hood to abandon it, and the experiment cost him great anxiety and loss.

Then after full deliberation of the difficulties in their various phases, the Proprietary Committee of the N. W. D. A. suggested in 1893, at the meeting in Detroit, that we confine our efforts to securing the co-operation of manufacturers in favor of giving wholesale prices and discounts to regularly recognized wholesale houses only, and thus giving the same protection to the retailer under the rebate plan that is extended to the wholesaler—namely, a uniformity of cost, which, it was believed, and is still believed, would raise the average schedule of retail prices.

The Denver Plan.

This proposition did not receive the co-operation from manufacturers at



CHAS. I. HOOD, LOWELL, MASS.,
President C. I. Hood Co.

that time which would insure its success, and an attempt to further strengthen it by what was known as the Denver Plan was proposed and indorsed by the N. W. D. A. at its meeting in Denver in 1895, and this feature finally received the indorsement of the newly formed National Association of Retail Druggists at their meeting in St. Louis in 1898, and is now receiving the active attention of the officers of both associations.

The St. Louis Plan.

It will be remembered that the proposition made in 1893 at Detroit contemplated that when 80 per cent. of the retailers of any city agreed upon a schedule, all dealers refusing to abide by that schedule should not be supplied either by manufacturers or wholesalers. The present proposition contemplates that practically a unanimous agreement as to schedule shall be arrived at by retailers of various localities, and that each city shall place under the jurisdiction of the Retail Association in that city the proposing of this schedule.

Every One Tired of Cutting.

All these things have been tried and signally failed. In all of them I have been a more or less active participant, but I do feel that if these errors are not repeated, and those who are at present in charge of the work of the National Association of Retail Druggists and its many local branches will avoid the errors which we, who had to do with it in the past, have made, and will devote themselves to the establishment of schedules which will meet the views of the cutters doing a large business and still leave a small margin, at least, for the smallest buyers, so strong a sentiment in favor of such proposition can now be secured to back up this effort that it will certainly attain success. All hands, I think, are tired of what may be called the "acute cutting." The large dealer, handling hundreds of dozen quick selling articles, by reason of his favorable location or his keen business foresight and capacity, or both, can very much better afford to relinquish the small advantage he enjoys in the cost of his purchases made direct in larger quantities at best discount than continue to compete with those who are willing and able to undersell him, so as to secure some other advantage, applying individually to that particular competitor only.

Hope in the N. A. R. D.

The lowest cut prices, as is well known, are not now being made in the larger cities by the original cutters, but are being made by some who use proprietary medicines as advertising bait solely and are willing to sell below cost; and so I confidently believe that if the latest proposition, just promulgated by the chairman of the Executive Committee of the National Association of Retail Druggists, will be taken up wisely and will be applied conservatively through the co-operation of local associations, by the establishment of schedules to which all can agree, by compromise rather than conflict, by encouraging a feeling of good will, rather than attempting force where force cannot be successfully applied, a part of the solution, at least, of the price cutting problem will yet be reached.

A Warning to Proprietors.

I cannot refrain, before closing this contribution, from sounding a note of warning to those proprietors who believe they can, entirely independent of the good will and co-operation of either the wholesale or retail druggists, market their specialties through some other channels than the drug trade, if they cannot have things their own way. Legislation antagonistic to proprietary interests must inevitably result from a continuance of a feeling of dissatisfaction and resentment, which will naturally characterize the wholesale and retail dealers in these articles, if a reasonable profit cannot be secured, so I hope that the latest and, as I believe, in all respects wisest, proposition which has ever been brought to the druggists, wholesale and retail, will have the united support of all three classes interested—the proprietors, the wholesalers and the retailers.

The History of Organization Among Manufacturers and Wholesale Dealers in Proprietary Articles.

By Herbert B. Harding,

Treasurer of the Proprietary Association of America.

NO review of the professional progress of past years, no delineation of the status of pharmaceuticals at the present time, as we face with hopeful hearts the dawn of a new century, would be complete without due appreciation of the work accomplished by the Proprietary Association of America.

Not until 1902 will the association have reached its majority, for it was in August, 1881, that the organization was effected, yet in less than its score of years it has brought about many reforms and placed the proprietary business on a commercial plane surpassed by no other industry.

Dr. V. Mott Pierce, Buffalo,

President Proprietary Association.

Genesis of the Industry.

To dwell upon the merits of proprietary preparations at this time is hardly necessary. They are popular. They satisfy a legitimate want of the people. The Indians hung roots and herbs in their cabins and sought the incantations of the "big medicine man" only when home remedies failed. Our grandmothers were learned in the virtues of catnip, boneset and milkweed. Later-day development has given to the household many comforts and conveniences, but none more truly valuable than the favorite prescriptions found in handy and attractive form in every home.

Many interesting facts in the history of proprietary remedies can be, and have been, told. With the demand for home remedies at the beginning of the century many proprietors rushed upon the market with compounds warranted to cure all kinds of diseases. Some took out patents on new remedies, and from this fact proprietary medicines to this day are commonly called "patent medicines."

Conspicuous success was only won when prescriptions tested for years by reputable physicians in their practice were placed on the market as specifics for well defined disorders. Trade-marks protect these latter-day remedies instead of patents, for it soon became plain that the publication of the ingredients of proprietary medicines worked an injury to the proprietor.

It was almost impossible to prevent infringements except when the infringer offended o a large scale, while it frequently happened that just as soon as a successful business had been created the patent that had been obtained expired.

It is an interesting coincidence that the same evil that brought the manufacturers of proprietary medicines together in 1881 confronts them to-day—namely, the existence of a war tax, the usefulness of which and the "urgent necessity" of which have passed away.

What Led to Organization.

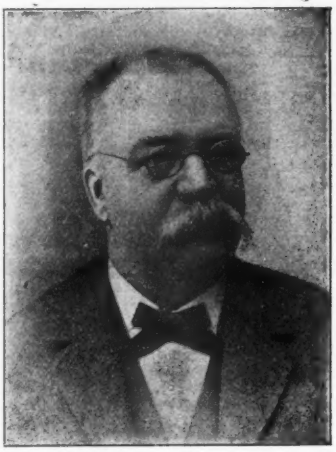
No better exposition of the causes which led to the organization of proprietary men being effected, and its early history, is possible than has been already given by Dr. Frederick Humphreys, one of its founders and for many years president. He says:

"The war had been ended for fourteen years before Congress gave thought to the repeal of the stamp tax on proprietary articles which had enriched the Government by something like $36,000,000. Even then they were disposed to make light of efforts of individual proprietors to have the tax abolished.

"Frequent informal meetings on the part of those interested had been held in New York in the offices of Charles N. Crittenton and Dr. Humphreys. At one of these meetings the writer said: 'Gentlemen, it is almost useless for us to try to fight this thing as individuals. We must organize. Only as an organization will our protests carry weight.'

"The idea was at once approved. The organization was effected in the office of Mr. Crittenton, on the second Wednesday of August, 1881, under the name of the Association of Manufacturers and Dealers in Proprietary Articles of the United States. The following officers were elected:

"Charles N. Crittenton, of New York, president; W. H. Hall, of Hall & Ruckel, New York, first vice-president; A. G. Weeks, of Weeks & Potter, Boston, second vice-president; F. W. McPherson, of Johnson, Holloway & Co., Philadelphia, third vice-president; Sturgis Coffin, of Young, Ladd & Coffin, treasurer; Dr. Fred. H. Humphreys, of Humphreys' Homœopathic Medicine Company, secretary, and Samuel Carter, of the Carter Medicine Company, corresponding secretary. The Executive Committee consisted of F. W. Hurtt, of Pond's Extract Company; W. A. Gellatly, of Wm. H. Schieffelin & Co.; Brent Good, of New York; Dr. J. H. McLean, of St. Louis; Dr. F. Humphreys, Col. S. R. Pinckney, of the Himrod Mfg. Co., and John F. Henry, of J. F. Henry & Co.

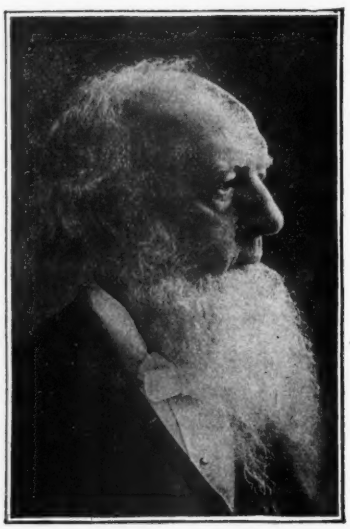


Thomas Doliber, Boston,

Former President Proprietary Association.

Repeal of the Stamp Tax.

"On December 1, 1881, a public meeting was held, at which a number of new members were admitted. Through the



Dr. Frederick Humphreys, New York,

Former President Proprietary Association.

JOSEPH LEEMING, NEW YORK,
Sec'y Proprietary Association.

FRANK A. RUF, ST. LOUIS,
Pres't Antikamnia Chemical Co.

JOHN W. COX, NEW YORK,
Sec'y Antikamnia Chemical Co.

HERBERT B. HARDING, NEW YORK,
Treas. Proprietary Association.

efforts of the association the stamp tax was repealed March 5, 1883.

"Organized primarily to fight an extortionate and unnecessary tax, the association soon discovered that it had even more important business on its hands. For seven years there had existed an association of wholesale druggists who were struggling, apparently in vain, to solve the perplexing problems of their trade, one of which was the unnecessary and ruinous cutting in the prices of proprietary medicines.

"Under date of April 17, 1882, a communication was received from the committee on Proprietary Articles of the Western Wholesale Druggists' Association (Daniel Myers, of Cleveland, chairman), setting forth the injury to proprietors resulting from the then existing system, as it tended to multiply the number of proprietary medicines in the market, and setting forth the advantages of the rebate plan already used by such houses as Dr. D. Jayne & Son, the Rumford Chemical Works, Colgate & Co., the Maltine Company, and others. A committee was accordingly appointed to learn the sentiment of proprietors generally on this subject.

"The leading opposition to the plan at that time was by John D. Park & Sons, of Cincinnati, who consistently fought it for many years. The committee, of whom Brent Good, of New York, and the writer are the only surviving members, had a conference with the committee of wholesalers and unanimously indorsed the plan.

Co-operation with the N. A. R. D.

"At the first annual meeting of the proprietors' association, held at Long Branch, a committee of fifteen, of which Dr. Humphreys was chairman, was appointed to attend the annual convention of the N. W. D. A. of Cleveland. A committee on contract plan was also named at this meeting, with M. N. Kline, of Philadelphia, chairman, and the rebate system, essentially as at present conducted, was soon in active operation through the harmonious co-operation of the two associations.

"At first there was more or less friction between wholesale druggists, some of whom were accused of violations of contracts. Proprietors were also accused of not withholding the rebate in certain cases when druggists had violated their agreements; but such differences were adjusted, and for years the system was eminently successful, at first under the direction of George A. Kelly, of Pittsburg, and afterward under M. N. Kline's admirable management.

Beneficial Effects of the Organization.

"Since the adoption of the system there has scarcely been a failure in the wholesale drug trade. Every wholesale druggist is assured of his 10 per cent., and an occupation that was formerly the most precarious has, through co-operation and common sense, at last become one of the safest and most remunerative.

Battles Fought.

"The association has fought other battles, each of which deserves a chapter all to itself. In 1883 it began a crusade against the taxing of grain alcohol when used in the arts and manufactures. A bill was finally passed by Congress granting to manufacturers a rebate of nearly the whole amount of the tax on proof being furnished that the alcohol had actually been used exclusively for non-potable manufactures or in the arts. This bill was nullified by the Secretary of the Treasury refusing to issue regulations to carry out its provisions.

"Another subject that has occupied the attention of the association has been the competition of imitation goods and infringements of trade marks, and the members of the National Wholesale Druggists' Association, into which the Western Association grew, were asked not to handle such goods.

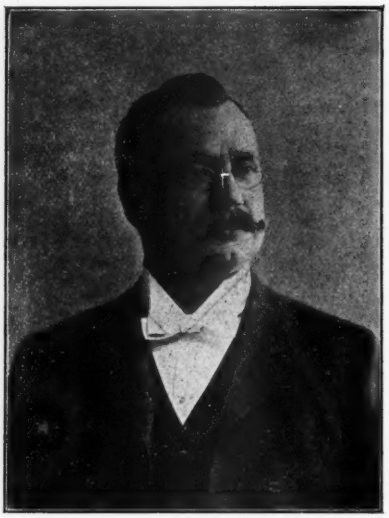
"Finally, in 1887, the N. W. D. A., through Mr. Richardson, of St. Louis, sent word, 'If you proprietors will decide as to what are imitations, we will covenant not to handle them.'

"Dr. Humphreys, who was then pres-

R E QUEEN, SAN FRANCISCO, CAL.,
Former President Proprietary Association.

FRED SULTAN, ST. LOUIS,
Of the Sultan Drug Co. and the Peacock Chemical Co.

CAPT. I. E. EMERSON, BALTIMORE,
President Emerson Drug Co.



CHAS. H. PINKHAM, LYNN, MASS.,
President Lydia Pinkham Co.

ident of the association, accordingly appointed a joint commission which met in September of that year in New York City, to pass on this important subject. The commission consisted of the writer as chairman, C. N. Crittenton, of New York; H. H. Warner, of Rochester; H. E. Bowen (for John F. Henry), and T. F. Main (for M. N. Kline).

"The result was an elaborate report upon the salient legal points and consequent trade ethics which was unanimously adopted and widely circulated. From the first it was seen that the true mode of adjusting differences was by explaining mutual rights and by making mutual concessions rather than by legal tactics, and this method has been generally found successful.

"The prevention of unjust and oppressive legislation has also been one of the functions of the association. The late John Hodge won distinction by his services in this direction. He utilized the public press in the exposure of schemes to tax the necessities of the industrious middle class, for to this class belong most buyers of proprietary medicines.

Past and Present Officers.

"From 1881 to 1885 Charles N. Crittenton was president of the association; from 1885 to 1888 the honor was conferred upon Dr. F. Humphreys; R. V. Pierce, M.D., served from 1888 to 1894; Alfred B. Scott was president the following year; R. E. Queen succeeded him, and the officers from 1897 until the present time were as follows: 1897, president, Thomas Doliber; and 1898 and 1899, V. Mott Pierce, M.D. At present writing E. C. De Witt is first vice-president; H. L. Kramer, second vice-president; Joseph Leeming, secretary, and Herbert B. Harding, treasurer.

"Joseph Leeman, elected in the year 1891, and H. B. Harding, in 1890, are the oldest officers in point of service. In 1897 the name was changed to the present shorter and more euphonious title of 'Proprietary Association of America.'"

A Significant Epoch.

I do not think it will be denied by the members of the association that in 1886 there seemed every indication that the usefulness—the *raison d'etre*—of the association had ceased to exist. The object for which it had come into being had been accomplished—namely, the repeal of the tax imposed on proprietary articles because of the Civil War. Other matters had arisen, as Dr. Humphreys has pointed out, and they had one by one been remedied—at least to a certain extent. Of course, the greatest victory had been the adoption of the rebate system, and although there was occasional backsliding or at least reports of such lack of faith, the general conditions were fairly satisfactory.

Mr. Doliber Steps Into the Breach.

Everything pointed to the dissolution of the association and its probable con-

TIMOTHY L. WOODRUFF, NEW YORK,
Lieut.-Governor of the State of New York, President of the Maltine Mfg. Co.

solidation with the N. W. D. A., when Thomas Doliber, of the Mellin's Food Co., was elected its president.

It is hard not to let enthusiasm for the new vigor, the new life, the wholesouled ardor which Mr. Doliber threw into the organization, carry one away into extravagant terms of praise. Certain it is that he held the proprietors together at a time when it is probable no one else could have done it. That it was a good thing for the association and for proprietors all over the country no one will dispute, for once more we are confronted with the necessity of the repeal of a war tax the usefulness of which has departed.

Just about that time, too, a great deal of adverse legislation seemed to spring up all over the country. In every State in the Union bills began to be introduced in the various Legislatures tending to hamper the manufacture and sale of proprietary medicines.

The Spanish-American War Tax.

When the war with Spain broke out and another war tax was suggested, the first proposition of the Government was that the tax should be the same as it was during the War of the Rebellion—four per cent. of the retail price. This was strongly objected to by the association as being much too large, and it was through our efforts that a compromise was finally effected.

The association proposed a one per cent. tax, and after considerable argument a half-way measure was adopted, the tax being finally settled upon as 2½ per cent.

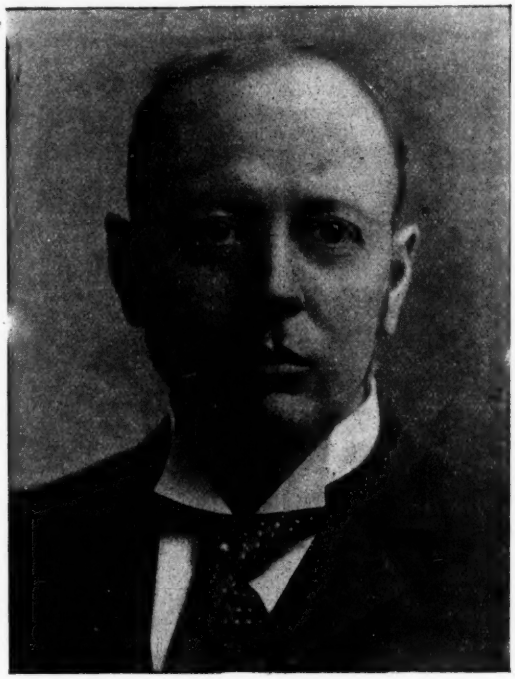
Something To Be Proud Of.

By this one act alone, if the association of proprietors had never done anything else, it should have earned the gratitude not alone of every proprietor but of the druggists of the entire country as well. The tax, you must remember, is not upon patent medicines, so-called, alone. It is upon other proprietary articles, which include cosmetics and many preparations prepared by druggists themselves. Hundreds of dollars were saved to retailers by the re-

duction from 4 per cent to 2½ during the three years that the tax has been imposed and collected.

The Present Great Movement.

And now we come to the work upon which the association is expending its best efforts at the present time—the repeal of that 2½ per cent. war tax. From all over the country petitions are going in to Congress from manufacturers and druggists, and the local retail associations are also doing all in their power to have the law repealed.



E. C. De Witt, Chicago,
Vice-President of the Proprietary Association.

Time to Remove the Tax.

That the time has about arrived for Congress to take action few will deny. The revenues in excess of public necessities for the current fiscal year are estimated at nearly, if not fully, $60,000,000; the Treasury Department has recently discharged about $25,000,000 of the public debt by the purchase of bonds not yet due; and there was in the Treasury on February 10, $296,760,054 available cash. The entire Spanish war loan remains practically unexpended and lying idle in the Treasury or in the banks to the Government credit.

Yet the Government, having that money on hand unused (and without any use for it), is now collecting from the taxpayers of the country millions of dollars every month more than it needs, even if the present military expenses continue; whereas there is every prospect that they will be reduced, and no prospect of their increase.

Under these circumstances the perpetuation of the harassing and oppressive stamp tax upon proprietary medicines, perfumery, etc., is absolutely without excuse. To say that a tax of 2½ per cent. is imposed upon the nominal retail price of proprietary preparations conveys no adequate idea of the real burden. In the first place, the manufacturer sells his goods at two-thirds or less than two-thirds of the nominal retail price, so that the tax amounts on an average to at least 4 per cent. of his gross receipts, and this amounts in nearly all cases to 30 per cent., and in many instances to 35 or 40 per cent. of his net receipts.

Where the manufacturer can add the tax to the wholesale price, the burden can be shifted; but in many instances trade conditions are such that the manufacturer finds himself wholly unable to shift this burden, and, in such cases, the stamp tax is equivalent to an income tax upon the manufacturer of more than 30 per cent. It is impossible to believe that Congress ever intended to impose such a ruinous burden upon any class of American citizens.

The Tax Upon Alcohol.

It must not be forgotten, too, while on this subject, that in addition to the stamp tax, manufacturers are forced to pay the heavy tax upon alcohol used in the manufacture of their product. As alcohol is an essential ingredient in many medicines, and in nearly all perfumery, many manufacturers are thus subjected to double taxation of the most unjust and burdensome character.

The idea prevails that the receipts of manufacturers of proprietary medicines are mostly profits. This is simply a delusion, and a tax based upon this theory results in very great injustice.

The total revenue derived during the last fiscal year from articles named in "Schedule B" of the War Revenue Act was $5,219,737.46, which includes the amount levied upon medicines, perfumery and cosmetics. While it is impracticable to state the exact amount levied upon those articles, it may be estimated at $4,000,000 a year.

This is a small sum to the Government (being less than the amount of surplus revenue collected in a single month), but it is an enormous sum to exact from a few manufacturers and retail druggists in order to swell an already overflowing treasury.

Just how hard the druggists of the country are working with us toward the repeal of the tax cannot be told in words. Personal letters to Congressmen are pouring in on these gentlemen, personal arguments are being used, and the help of local newspapers all over the country is being impressed into the fight. That we are sure to win is the opinion held by all, but it may take longer than some of the more sanguine among us imagine.

On February 14, 1900, Congressman Levy introduced into the House of Representatives a bill looking to our relief. It was referred to the Committee on Ways and Means and ordered to be printed. Section 6 is the one that deals with the tax. It reads as follows:

"That the taxes upon medicinal proprietary articles and preparations, and upon perfumery and cosmetics, and other similar articles imposed by Schedule B, and provided for in section twenty-five of the Act hereby amended, are hereby repealed."

With the early repeal of the war tax now in view, with the medical fraternity and the public daily recognizing the virtues of proprietary medicines more and more, with the conditions upon which proprietary manufacturers and wholesale and retail druggists conduct their business upon a most equable and satisfactory basis, with the affairs of the association upon a sound financial foundation, we can look forward to the new century with a proud hope that if the record of the past is lived up to in the future we shall not then have labored in vain.

Chas. W. Fletcher, New York,
President Centaur Co.

The Organization of State Associations.

By Clay W. Holmes,

For Seventeen Years Secretary of the New York State Pharmaceutical Association, Elmira, N. Y.

IT is only within the last half of the nineteenth century that pharmacy has developed on its own merits. Previous to 1850 pharmacy was practically in the hands of the medical profession. Simple remedies were employed, and the physician both prescribed and dispensed. It required no special knowledge on the part of the dealer in drugs and medicines to supply the simple remedies then in use. This condition existed in fact up to 1860 in the rural districts and in nearly all parts of the country, except, perhaps, the few large cities.

Organization of the A. Ph. A.

About this time a sudden change came over the spirit of pharmacy. The Civil War brought the public face to face with many new problems, and business developments were rapid in all branches. In 1852 the A. Ph. A. was organized as a purely scientific body, which was probably largely inspired by a few zealous pharmaceutical laborers, who foresaw the necessity of a practical education in pharmacy to enable dealers in medicines to cope with the advance of medical science.

Early Problems.

A few colleges of pharmacy came into existence during these years, and sent forth a moderate sized corps of able toilers who were at once successful. During this early period the handling of drugs was rapidly passing from the office of the physician to the regularly appointed store, and the number of drug stores rapidly multiplied. Like the gold fever of 1848, it seemed to be the desire of many men who had some money, but no education, to rush pell mell into the drug business, allured by the apparent profits. Such a condition created two immediate and urgent problems. The first, means of education for the business; and second, restrictions upon the practice of this rapidly developing profession, which was so intimately connected with the life of the public. The first problem we pass, as it is only incidentally connected with the subject. The second is the main factor in the history of State pharmaceutical organizations, and to it is doubtless due in large measure the organization of every one of the State associations now existing. That the need was universal is clearly shown by the fact that in the space of twenty-three years thirty-nine associations were formed, and that the second problem above stated was the leading thought is also indicated by the records of these associations, which show that almost the first business in each one was the enactment of laws regulating the practice of pharmacy.

The First State Association.

To New Jersey is due the honor of being the first on the list.[1] The year 1871 witnessed the organization of her association. New Hampshire followed in 1874; Rhode Island in 1875; Connecticut, Georgia and South Carolina in 1876; Kentucky and Pennsylvania in 1878; Missouri, New York and Ohio in 1879; Illinois, Iowa, Kansas, North Carolina, Texas and Wisconsin in 1880; West Virginia in 1881; Alabama, Massachusetts, Nebraska and Virginia in 1882; Arkansas, Indiana, Louisiana and Michigan in 1883; Maryland, Minnesota and Mississppi in 1885; North Dakota and Tennessee in 1886; South Dakota, Florida and Delaware in 1887; Colorado, Maine and Washington in 1890; Oregon in 1891; Utah in 1892, and Vermont in 1894.

A. Ph. A. Gave the Impetus.

Judging from our personal knowledge of the organization of the Pennsylvania and New York associations, we are led to attribute the original conception of the State organization idea to members of the A. Ph. A., and feel reasonably safe in asserting that the original projectors of all these thirty-nine associations were active, working members of the A. Ph. A.

And here permit us to digress from the theme to pay a well deserved tribute of praise to this time honored body. We have heard it stated many times within the last ten years that the A. Ph. A. had outlived its usefulness, that it was too scientific for the present age, and should be relegated to "the has beens." Permit us to state that all of good accomplished by the State pharmaceutical associations, which has been of commercial value most largely, is due in great measure to the zealous efforts of the working members of this scientific parent body, who saw the necessities of the age, and, realizing that the local needs of pharmacy as a business proposition could not be wielded by a national body, took the advance steps in organizing State bodies to deal with the commercial problems of the hour. To her then all honor is due, and every pharmacist in the land should be proud to have his name enrolled on the A. Ph. A.'s list, even though his mind does not dwell so much on pharmacy as it does on the cut rate problem. Pharmaceutical science cannot be divorced from pharmaceutical commerce without destroying the latter.

A Tribute to the A. Ph. A.

There seems to be a sphere for State organizations, and their scope is largely one of commercial interests. So long as each State regulates all affairs within its borders, so long there will be a need for pharmacy to maintain State organizations. The experience of nearly every State association indicates that so long as there is need for pharmaceutical legislation her life is vigorous. When this factor does not present any need for action, association life languishes, in spite of efforts made to keep up interest by athletic attractions or amusing entertainments. Some associations have been able to maintain a scientific interest, but this seems to be successful only in such States as have a predominance of teaching college members, and in some States not even under that condition.

This state of affairs is due largely to the inherent nature of the druggist, whose business life is so prescribed by the limits of his surroundings that he becomes selfish and sordid, and as he sees his business gradually stealing away from him he becomes a natural enemy to all mankind and his competitors in particular, and, like the hunted rabbit, seeks his own hole and tries to pull the hole in after him.

The Advantages of Organization.

This suggests a thought as to the advantages of State organization, or even associations of a more local character, which is often lost sight of. Contact with others in the same calling tends to broaden one's views, and soften the trials of business life. There is nothing which benefits the retail pharmacist so much as to get away from his little six by nine store and rub up against his next door competitor. He cannot do this at home, or, rather, he will not, but when he goes to the State association meeting and compares notes with others, and discovers that his neighbor is a man like himself, the world looks better, and his neighbor becomes a good fellow after all. State associations have accomplished something in this line, and would much more if all the druggists in the State would join and attend the meetings. It is a noticeable fact that those who are to-day doing a successful business in the line of pharmacy are members of their State association, and many of them also of the A. Ph. A.

The Great Accomplishment of State Associations

has been in the line of regulating the practice of pharmacy, by restricting it to those who by education are fitted for it. This end has been reached by legislative enactment, brought about by the influence of the various State associations. There is an intimacy between the college of pharmacy and this condition which leads us to state that without doubt there has been exercised a great weight of influence on the part of the various colleges to bring about such results, but it is entirely legitimate, as education provides the only successful life of any profession, therefore the trade of pharmacy is deeply indebted to the profession represented by the colleges for the better condition of things existing to-day.

There are many other factors entering into the commercial condition of pharmacy which might be referred to as counteracting much of the good which has been accomplished by State associations, but it is not fair or just to charge these faults to the professional side of pharmacy. If we could contemplate what the condition of pharmacy as a trade would be had not these State organizations been brought about, and eliminating the benefits which have accrued therefrom, methinks there would have been no profession of pharmacy at this time, and we could not be able to point with pride to the rapid and steady advance of pharmacy during the closing years of the nineteenth century.

[1] An organization was established by the pharmacists of Vermont in 1870, but it was short lived. The State was practically without a State association of pharmacists until 1894.

Early Pharmacy in the West.

By Albert E. Ebert, Ph.G., Ph M.,

Chicago, Ill.

THE settlement of the West, or more properly speaking the "Northwest," dates back to the early thirties, for in 1831 the straggling village of Chicago had about 61 inhabitants, yet it had become the immigrants' station from which the land near and far was prospected, and from which villages and cities subsequently were laid out, the same cities and villages that now dot the great West.

When Chicago Had No Drug Store.

There is no record of a drug store at this time, and the supply of medicine was most likely confined to that of the surgeon of Fort Dearborn. In the summer of 1832 came General Scott with some 300 troops to take part in quelling the Indian uprising known as the Black Hawk War, and with him he brought that dreadful plague, the cholera.

One-third of the entire number of his soldiers were afflicted and many died. This caused a panic, and nearly all of the settlers who a few weeks previously had flocked into the fortification in fear of the Indian fled before this more-to-be-dreaded scourge. Among those who had come to the place this year was a young man from Massachusetts, a druggist, who on learning of the need of nurses at the fort, volunteered his services and did excellent work during the continuance of the epidemic. In the fall of this year he opened

The First Drug Store in Chicago

and from this dates our history of pharmacy in the West.

Taking Chicago as a common point to base our observations upon, we find that all the early druggists were from New York and the New England States, and consequently the business methods were modeled after Eastern ideas. The first drug stores in the West were the meeting places in the evening for the better class of the citizens of the town, to discuss the events of the day, and where the needs of the place were talked over and shaped for presentation to the trustees or selectmen to be drafted into ordinances, finally, to become laws for the government of the embryo city.

The Furniture of the Drug Store

was plain, the prescription case or department was a prominent feature, as it is to-day. The drawers then in use were much larger, the shelf bottles were not so generally glass stoppered, and their arrangement was the reverse to what is now in vogue, the larger ones being on the top shelves. Wide mouth, glass stoppered bottles were not common, but a specie jar with a tin cover was used. The label of the drawers and the glass shelf ware was a bronze paper label. Glass showcases were an almost unknown quantity, and shelving inclosed by glass doors were not even dreamed of, but the show bottles for the windows were then as they are now, with this difference, that of being larger and consisting of more pieces, the lower holding from 3 to 5 gallons of water. The ponderous iron mortar, a Swift's drug mill and a tincture press were ever present and formed the pet aversion of the apprentice, as they comprised the working tools with which he spent many weary and tiresome hours. The old-fashioned beam scales were always in evidence.

Early Druggists Men of Education.

The proprietors of the early drug stores of the West were men of education and strong personality; they conducted themselves with becoming dignity, were looked up to by their fellow-citizens, and have left a record of which their descendants may be very proud. The first druggist in Chicago was foremost in all charitable and philanthropical movements, the second was one of the founders of Rush Medical College, and was a leader among the men who had the political and economical welfare of the community at heart. The third organized the first fire department and was a champion of free schools. Another was more than prominent in his advocacy of sanitary measures for the minimizing of zymotic diseases and one of the founders of the Academy of Sciences and Historical Society, and there was still another who originated the present system of tunnels and cribs for supplying Chicago with potable water from the Lake; a fourth became prominently identified with Chicago's manufacturing interests, and so citations could be multiplied. The showing is a splendid one, and proves our assertion that the pioneer druggists were men of superior ability and their success was not due to accident.

Clerks and the Early Apprenticeship System.

Coming now to the clerks, we find that they were also men of sterling worth and those who are still alive are to be found as leaders in the profession in this city or wherever they may be located between here and the Pacific Coast.

In the early fifties, when I commenced my apprenticeship to the business, one of the precepts that was impressed upon me by my employer was that while the commercial side of the business must not be neglected, yet the professional side must never be superseded by it. The salary of a drug clerk in those days did not depend upon how many nostrums he sold, but upon what his knowledge and skill were in the preparing and dispensing of drugs and medicines. These qualifications fixed his compensation and his employer's estimation of him. This unfortunately has been almost wholly changed, and now the drug clerk's ability to sell goods regulates his salary the same as it does those of the grocer's or dry goods clerk.

The Period of Apprenticeship.

We will now consider that important personage, the apprentice. While it

R. W. Diller,

A Veteran Illinois Druggist.

was not customary to make written indentures, yet it was invariably a verbal contract that the apprenticeship should cover a period of four years, and the compensation was usually fixed at the rate of $100 for the first year, with an additional raise of $100 for the succeeding years. To be an apprentice to the drug business in those days was anything but an enviable position; in fact, the work required of the apprentice deterred many from continuing in the business until they had served the full time and had become competent to assume the position and duties of a clerk —very few retail stores had a porter employed to do the hard work, and consequently it was a continual grind for the apprentice from morning to night. He had to sweep out the store and dust the shelf ware daily, mop the floor and wash the windows weekly, wash the bottles, grind in the mill or powder in the mortar all the drugs, roots, barks, etc., not omitting from mention the tedious process of making mercurial ointment; powdering the gum resins in the cold winter days, run all the errands, and make himself generally useful to everybody and do everything that he was able to do. When the evening came it was expected that he would study the Dispensatory, commencing his reading at a and going through to z, and later when the soda fountain was added to the equipment of the store he was intrusted with this additional work. Many fell by the wayside and took up other occupations, never regretting, however, that at one time they had been connected with the drug business, the experience thereby gained having been of great value to them in other vocations of life.

The Literature of the Pioneer Druggist

was very meager, indeed, his professional library being limited to a copy of the United States Dispensatory or Coxe's American Dispensatory, sometimes a stray copy of the London, Edinburgh or Dublin Dispensatories, and possibly a copy of Kane's or Fowne's Chemistry —"The American Journal of Pharmacy," a bi-monthly, the first publica-

tion devoted to pharmacy in the English language, reached us in the forties, and in the fifties the "Druggists' Circular and Chemical Gazette" became a monthly visitor in the more progressive stores. However, the real lore of the drug business was principally confined to the private formulary of the store. In this important tome was found a collection not only of private formulas, but also official formulas and processes of the pharmacopœias and other standard works.

The Earliest Educational Efforts

of a scientific character made in Chicago date back to the winter of 1840, when Dr. John T. Temple gave a public course of lectures on chemistry—supplemented in 1843 by the regular course of instruction in Rush Medical College.

In 1853 the American Pharmaceutical Association issued a circular letter making inquiry into the condition of pharmacy as it existed in the different sections of the country. A correspondent member was appointed for Illinois, the result of which was that three Chicago druggists became members of the association. From this time on there was a rapid advance in the professional side of the drug business, and the names of Charles Ellis, William Procter, Edward Parrish and other members of this national organization became familiar shop words.

The First College in the West.

A movement was started for the establishment of a school of pharmacy, and this was so well received by the members of the trade that the Chicago College of Pharmacy was organized and incorporated, and in the winter of 1859 a complete course was given and continued until the breaking out of the war in 1861. The membership in the American Pharmaceutical Association from this time increased rapidly, so that when in 1869 the association held its seventeenth annual meeting, Chicago was only exceeded in point of membership by the cities of Philadelphia, New York and Boston. The year previous to this meeting saw the inauguration and establishing by the Chicago College of Pharmacy of "The Pharmacist," the third pharmaceutical journal of the country, the value of which as a promoter of professional pharmacy is a matter of history.

Alcohol in Payment of Accounts.

We will now return to the commercial side of the business in its early days in the West. The first attempts to maintain a drug store, pure and simple, were not a success from a financial point of view, and although several of the pioneers started in business with only drug stocks, they found themselves compelled to adopt the general store plan, in keeping everything that there was a demand for. It was not until 1840 that an exclusive drug store was successful, and it was not until 1850 that the drug store parted company with the merchandise of a general store. Drugs were bought in New York and Boston and probably in St. Louis, which had a population of 16,000 in 1834, for we find an advertisement of a wholesale drug house of that city in the early Chicago papers. The paying for the goods bought was a serious matter, exchange on New York or Eastern points being very high, and in order to save this and the discount charged on Western bank bills alcohol was purchased by the Western merchant and shipped East in payment of accounts.

Chicago always has been the great grain market, and farmers for a radius of 50 to 100 miles brought their produce by wagon to this market in the early days and in return bought their necessary supplies here. Therefore business was unquestionably very good in those days, as is evidenced by the following extract from the diary of one of Chicago's earliest druggists, who commenced business in October, 1838, with a $2,000 drug stock:

"I had no trouble in selling nearly everything for money at a great profit in the course of the winter. In December, 1838, or January, '39, I purchased a lot of drugs and medicines brought late in the fall from the East amounting to about $300. These also I sold in the course of the winter at a fair profit, although they were bought high. About January 1, 1839, I sent an order for about $500 worth of goods to Boston to be shipped to this place via New Orleans. They arrived about the 20th of April, and by the middle of the next month were mostly sold."

The Channels of Distribution.

It will be seen from this that drug stocks moved quite rapidly in those days, but it must be also remembered that there was not the multiplicity of articles that comprises the stock of the modern store. Their shelves were not littered with proprietary medicines and pharmaceutical specialties. At that time some of the manufacturers of patent pills, etc., sold their wares through the Book and Stationery stores, and even informed the public by advertisements in the newspapers that they did not allow the drug trade to handle their goods. It is a great pity that they did not continue that course, for if they and all the other nostrum makers had done so it would have been very much better for the pharmacy of those days as well as of to-day, for the trade would never have had to have battled with the cut rate evil on this class of merchandise; but, as Whittier says, "Of all sad words of tongue or pen, the saddest are these: 'It might have been.'"

REMINDERS OF AN OLD-TIME PHARMACY IN MAINE.

When George W. Merrill purchased the drug store on Middle street, Portland, Me., so long occupied by Dr. Edward Mason, he acquired possession of articles of furnishing that are quaint and interesting as reminders of features of the past in the drug business, which Mr. Merrill appreciates so much that he has always found room for them along with his modern equipment. Among these relics are several shelves of shop bottles, their golden lettering still indicating how elegant they must have been when first displayed by their proud owner. The original shop drawers are still in use, though fully sixty years old. These drawers were made of wood taken from the old Second Parish Church on Middle street, when that structure was remodeled. The material is clear pine, wide pine, so much esteemed by workers in wood. Their knobs are made of old-fashioned molded glass. The contents of one of the show bottles for the windows, green in color, are the original solution put into it by Dr. Mason half a century or more ago. A sample of old time patent medicines is a box of pills bearing date of 1839. "Dr. Kingsley's Vegetable Pills" is the inscription on the outer wrapper of this, which is ornamented with two cuts, one being the picture of a comfortable, full fed man, who is styled "Kingsleyite," while the other represents an attenuated, forlorn looking creature, who is designated as "Grahamite." Why these portraits are thus contrasted is not apparent from studying the wrapper, unless it is intended as a fling at the system which the Grahamite represents. One of the most interesting things in the collection is a vial of "Hawes's Healing Vegetable Extract," a small-necked, high-shouldered affair of blown glass. It has never been opened since it was first filled, yet so long a time has elapsed since then that fully one-third of the contents has evaporated through both the tight-fitting cork and the protecting wax smeared over the top.

Mr. Merrill has also a hard wood mortar and pestle, which was made in Gorham and has the date 1776 deeply cut into it. He purchased it of a former member of Chandler's band, who authenticated its age by giving Mr. Merrill the names of the successive owners. The mortar was made of that part of the maple tree where a limb grows, known to be the hardest portion. It is evident that it was laboriously cut and carved by hand and has seen long service, being much worn, while the pestle is ground down considerably.

PROGRESS IN CHEMISTRY OF COLD.

The luxurious Greeks and Romans knew almost nothing of the luxury of ice and its thousand uses. Nine months of the year some of the Greeks could see snow on the top of Mount Olympus, but they knew little of the comfort of ice. It would seem that there ought to be little need of making cold by difficult processes, when space is full of it. Go up a little ways above the earth anywhere, and you strike the awful cold of from three hundred to four hundred degrees below zero. The North Pole, when turned away from the sun in this cold space, easily gets a temperature of one hundred degrees below zero.

Cold may be considered as an entity, a real thing, to be handled and its effects studied. Mix two parts of snow or fine ice with one part of salt, and the temperature of the compound sinks thirty-seven degrees. Add to the mixture about the same amount of nitrate of ammonia, and it sinks twenty degrees further—that is, to twenty-five degrees below zero.

Air subjected to great pressure becomes very hot. If the wad is not permitted to be blown out of the pop-gun, a piece of punk will be ignited when the rammer is forced down. If after the pressure the air is cooled, it becomes a liquid. Being allowed to expand into gaseous air again, it accumulates as much cold as it did heat during compression. A jet of carbonic acid gas that is crowded into a steel bottle with a pressure of one thousand pounds or so to the inch, instantly becomes a most beautiful solid snow on being allowed expansion by escape. The principle is that a condensed gas accumulates cold on being allowed to expand. There are many of these gases, as chloride of methyl, ammonia, etc.

NOTABLE DISCOVERIES OF THE CENTURY.

A simple enumeration of the great inventions of the century and the discoveries made in the sciences of medicine, surgery, chemistry, astronomy, biology, and archæology would be sufficient to show that in these hundred years the horizon of human thought and knowledge has widened out so far that the circle which bounded them before seems almost insignificant in the comparison. Take, for example, the marvelous changes made in methods of travel on land and water by the use of steam and electric motors. Up to the present century all the wit and ingenuity of men, exercised through all the ages past, had evolved nothing better for the purposes of travel than the sailing vessel by sea and the vehicle propelled by horse power on land. No great improvement had been made in these things in thousands of years. But this century has witnessed the invention, the swift development, and the general introduction of motive agents which have almost annihilated time and space, and wrought changes of inconceivable magnitude in society, industry, commerce and national life.

Equally far reaching and revolutionary have been the applications of electrical science, as seen in the telegraphic systems knitting all the world together, the telephone, electric lighting, and, in these latest days, wireless telegraphy. To this century also must be credited a vast extension of labor-saving machinery, of which the sewing machine, the reaper, and the typewriter are prominent examples.

Perhaps the most gratifying feature of it all is that the advance in every department of science and knowledge has inured so largely to the benefit and comfort of the people at large. Take as one simple instance the invention of the common match, now in such universal use, and what an immense stride it was from the old steel, flint, and tinder-box, the failure of which often necessitated an early morning call on our neighbor to borrow a live coal, to be taken home in ashes on the hand, to start afresh the family fire, which had during the night burned entirely out. It was but a little thing, but what a world of comfort and convenience was wrapped up in it. We would not do without it now, and wonder how our fathers managed to live under such privation. So in a thousand things the comfort of the world has been greatly advanced, and to-day there are to be found in the homes of the great mass of the people comforts and conveniences, and even luxuries, the thought of which never entered the minds of our forefathers. And who will not say that for all this the world has been vastly improved and the condition of its people infinitely bettered ?—*Leslie's Weekly.*

Uses of Natural Gas.

It is quite possible to make the expansive power of natural gas as it comes from gas wells, sometimes with a pressure of three hundred pounds to the inch, first freeze all the ice needed for a great city, and then heat and light the city afterward. Ice could be thus made at a cost of less than a dollar a ton.

One Hundred Years of Achievement in American Glass Manufacture.

By C. A. Tatum,

Firm of Whitall, Tatum & Co., New York.

THE art of glass making antedates the appearance of man on earth, having been practiced by Mother Nature herself in that wonderful laboratory that is inclosed in the everlasting hills. It may very truthfully be said that man used glass before he made glass. We find arrow heads and knife blades of obsidian or volcanic glass which might very well have been used by the cave dwellers in the days before the art of glass making had begun to wield a potent influence upon the civilization of Babylon and Egypt and Rome.

Early History.

It has come down to us from Pliny, who covered too wide a field of knowledge to be always reliable, that the discovery of the manufacture of glass was due to substituting cakes of nitre for stones as supports for cooking pots. He has it that there once landed upon the coast of Palestine a party of Phœnician merchants, who, finding no stones on which to rest the pots in which they cooked their food, resorted to cakes of nitre from their cargo, which they substituted for stones as supports for their pots. The heat of the fire, blending and melting the sand and nitre, formed molten glass, which ran before the astonished eyes of the Phœnicians, who had thus discovered a new art.

This narrative of Pliny's must be taken as *ben trovata*, for the disillusionizing chemists tell us that the heat of an ordinary fire is not sufficient to cause sand to fuse and that it was impossible for the Phœnician merchants to have generated the necessary 2,500 degrees Fahrenheit by means of their dinner fire. But it is a good story all the same, although it differs from wine in not having improved with age.

He was a poor man, says the brilliant and versatile Kate Field, who, in Seneca's day, had not his house decorated in various designs in glass; while Scaurus, the Aedile, a superintendent of public buildings in ancient Rome, actually built a theatre seating 40,000 persons, the second story of which was built of glass. That masterpiece of ancient manufacture, the Portland vase, was taken from the tomb of the Roman emperor, Alexander Severus, and should bear his name rather than that of the Duchess of Portland, who purchased it from the Barberini family after it had stood three hundred years in their famous Roman gallery.

How Venice Lost Her World Supremacy.

Venice was without a rival in the art of glass making during the thirteenth century. Miss Field tells the story of how the monopoly was basely taken from the beautiful Queen of the Adriatic. "No one," she says, "knows how long the City of the Doges might have monopolized certain features of this art but for a woman who could not keep a secret from her lover. Marietta was the daughter of Beroviero, one of the most famous glass makers in the fifteenth century. Many were his recipes for producing colored glass, and as he had faith in his own flesh and blood, he confided these precious recipes to his daughter. Alas for poor Beroviero! Marietta, after the manner of women, loved a man, one Giorgio, an artisan in her father's employ. History does not tell, but I have no doubt Giorgio wheedled the secret out of his sweetheart.

"Once possessed of these recipes he published and sold them for a large sum, then turning on the man he had betrayed, he demanded faithless Marietta in marriage. Thus it came to pass that the ignoble love of a weak woman for a dishonorable man helped to change the fortunes of Venice. The world gained by the destruction of a monopoly, one more proof of the poet's dictum that 'all partial evil is universal good.'"

Beginnings of the Industry in Great Britain.

The theft of the Venetian's recipes was not the only factor at work in spreading the art of glass making. About 1450 a number of Venetian glass makers were thrown into prison in London on finding themselves unable to pay the money penalty imposed upon them by the Council of Venice for the offense of plying their art in a foreign land. Seeing no other way out of the difficulty, they asked that they be accorded the privilege of working out their fines—a project which was in accord with the views and wishes of the English king. The artisans were freed and allowed to work out their fine, and thus the beautiful art of glass making was added to the growing industries of Great Britain.

Inevitable Growth of the Industry in the United States.

Step by step, gradually but inevitably, the art of glass making has been gravitating toward the United States of America, where the progress in the art has been such as to practically make us independent of the rest of the world. With due humility and all fairness, lest we grow over vain of our remarkable progress in the art, it must be said that we started with a vast and rich store of accumulated lore.

Equipped with better sand, Bohemia made clearer and whiter glass than Venice, thus wresting the laurels away from her, to lose them in turn to England when that country discovered flint or lead glass. The genius of American chemists has solved successfully the problems connected with the proportions and kinds of ingredients which go to make the best glassware, and thus by successive steps the nucleus of the art has been heading this way until it has finally established itself among us for an indefinite stay.

The First Factory in America a Glass Factory.

The first factory built upon the American continent of which we have record was a glass factory. It was erected near the English settlement of Jamestown, Va., and began its career with a humble output of bottles. There was no protection in those days, nevertheless the first manufactured articles to be exported from this country were none other than the bottles from that glass manufactory in the forests of Virginia.

This pioneer factory having died a natural death, was succeeded by others, some of which engaged in the manufacture of beads for the Indians, who have ever had a passion for these showy baubles. The Pilgrim fathers having settled in Massachusetts, the glass making art soon found a footing there, but does not appear to have thrived mightily, for we find in the records of the town of Salem that the town advanced to the glass makers the sum of thirty pounds, a sum which is not recorded to have ever been paid back. Thus early in our national career do we find record of an effort to create a boom in an industrial town by offering a bounty to a manufacturer. Somewhat later a glass factory was erected near Hanover Square, New Amsterdam, before the city came into the possession of the English and was given the name it now bears—New York.

Progress of the Industry.

These early efforts to plant glass making on American soil were followed by more ambitious ones, and in 1787 the Boston Glass Company obtained from the Massachusetts Legislature the exclusive right of manufacturing glass in that State for fifteen years. So successful was this company that it was followed by others until, as the years fled by, Boston was able in 1865 to manufacture glass that was equal to the best flint glass made in England. This was but the beginning of a success that was destined to develop into a triumph. As in other branches of industry America was preordained to lead the world in glass making, both as an art and as an industry of great magnitude.

In the purely industrial processes of glass making many notable improvements are to be recorded. The manufacture of green glass alone has witnessed many changes and the mode of production has been almost completely revolutionized. Where the old method of melting glass in pots took about twelve hours and the melting was conducted after the regular workers left in the evening, the operation of melting being an all-night process, the melting is now conducted differently. By the new process the glass is melted in tanks by a continuous operation, the melting being conducted at one end of the tank system, and the gathering and blowing at the other. The glass turned out by the tank system is lighter in color than the pot glass and, of course, the whole operation is conducted on a more economical basis, the furnace being in full blast day and night, with a day and night shift of blowers.

A marked improvement has been effected in the exterior finish of druggists' prescription ware, the improvement being due largely to the employment of petroleum and coal gas, which, although more expensive than the heat obtained direct from coal, is productive of better results so far as the finished appearance of the bottle is concerned. The stress of competition among glass bottle manufacturers has conspired to the use of methods for lightening the color of the glass, giving a shade more nearly resembling the flint, and doing away entirely with the old green color. The glass thus made is called Dutch flint, and while not equal to the pure flint glass, it is preferred to the ordinary green by the great bulk of customers.

In pure flint glassware the improvements have been in the direction of the manufacture of seamless bottles, while the quality of the glass itself is much superior to what it was ten years ago. The seamless bottles are now made very generally in factories, and the foreign article, which was formerly staple, is now almost entirely replaced by the domestic make.

Improvements in Druggists' Glassware.

Having traced thus far the development and growth of the glass making industry in its more commercial aspects, let us turn to the progress which has been made in the manufacture of the glassware in exclusive use by the pharmacist.

The Consumption of Prescription Bottles.

First, let us digress a moment to say that in no other country in the world is the consumption of glass bottles so great as in the United States. The reason for this is to be found in the greater material prosperity of the people of this country as compared with those of the old world. Here it is not the custom to preserve a bottle after it has once served the purpose for which it was originally intended. In the case of prescriptions particularly, excepting, of course, renewals, a new bottle is supplied with each order, while in Great Britain and on the continent of Europe it is the customary practice for those who have prescriptions put up to present a clean empty bottle with the prescription. In making small or large purchases of liquid medicines the same custom prevails. An extra charge is made for the phial or bottle in all cases where the container is not furnished by the party making the purchase. This has led to the general use of second hand bottles, which in the United States are usually destroyed, since no one would think of having a new prescription put up in a bottle that had once been used, or of bringing to the drug store an odd sized bottle for a certain specified quantity of a liquid drug.

Bottles in Use in the Beginning of the Century.

For prescription use practically only two kinds of bottles were in general use at the beginning of the century. In composition these bottles were of the commonest kind of green glass, while as to shape and appearance they were either long and slim like a phial or of a squatter form, round, and thicker than the phial. The neck varied considerably in both width and length and the lip was thin and irregular, making it difficult to deliver the medicine evenly. The size of the drop was never the same with any two phials, and the shape, or rather absence, of lip on the phial made it difficult to cork properly, a trickle generally contriving to steal over the side and disfigure the label. In those days the label was usually secured by one end to the neck of the phial by a string, the free end bearing the directions for giving the medicine flaring out at right angles to the phial itself.

The use of these bottles continued until fairly well on in the century, and they constituted about the only style of prescription bottle that was then available for the pharmacist.

The Dawn of Improvement.

The old octagon shaped bottle had a certain vogue about 1825, but it did not completely replace the phial form. The awakening spirit of the century, which demanded improvement and still improvement in all the arts and trades, was felt equally in the apothecaries' business. Efforts were put forth in various directions looking to the improvement of the store, and the form and style of bottles and boxes received an equal share of attention. The old fashioned phials and octagon shaped bottles were gradually discarded and the manufacturers began to furnish bottles of a more attractive appearance, an oval shaped bottle being among the earlier innovations in prescription ware. The bottles then began to be finished with a heavier lip, and the size of the mouth was regulated to a uniform model. Tools were used in place of the old hand work and more regular results were thereby secured.

Later Improvements.

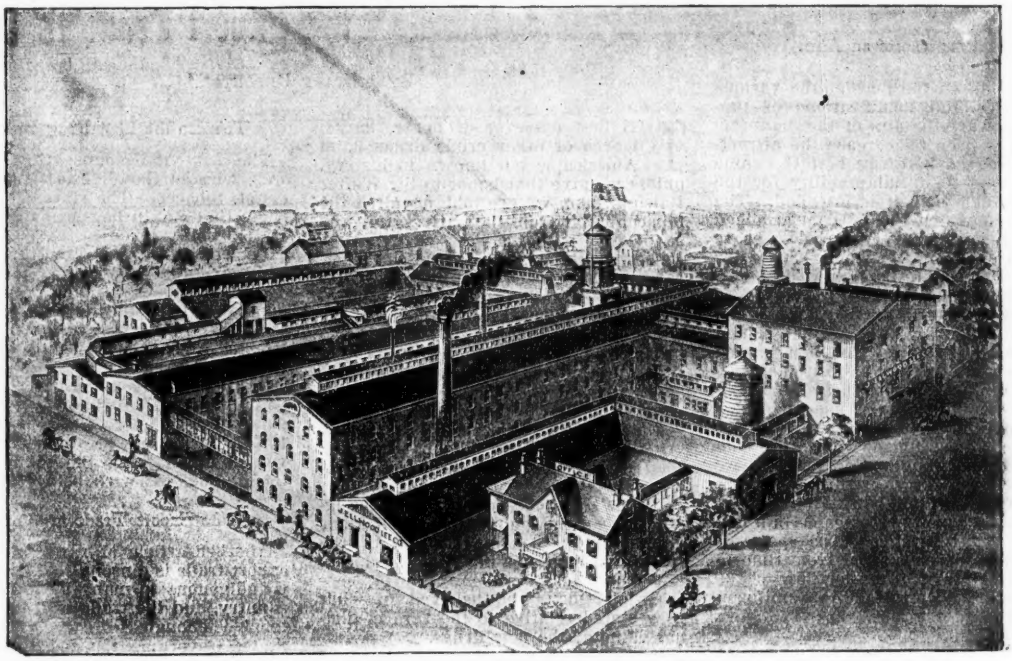
The next improvement in prescription ware was brought about in the substitution of flint for the common green glass. The first flint glass prescription bottles made their appearance about 1861, and from that time on the styles of prescription bottles began to increase and the finish to improve.

The first marked improvement in the shape of prescription bottles was the introduction of a tall four sided bottle with beveled edges, which was called a French Square, and almost at once became popular all over the country. This was followed about 1867 by the appearance on the market of lettered bottles, that is, bottles bearing on one side in raised letters the name and address of the pharmacist, accompanied in some cases by devices, monograms, etc. The lettering was molded on the bottles by means of a special device known as a Plate Mold. This consisted of a metal plate made of varying sizes to fit the various molds used in casting bottles of different shape.

Lettered Bottles Popular.

These lettered bottles were popular from the start and are widely used today. Besides forming an acceptable and enduring method of advertising, the bottles are of more attractive appearance than the unlettered ware, and the additional cost of lettering being comparatively small—$1 to $2 for each plate—it is easy to understand why they are popular. The invention of these plates was a real boon in its way, since prior

"THE HOME OF ASEPSIS."



The Finest, Best Equipped and

LARGEST PLANT IN THE WORLD

DEVOTED TO THE MANUFACTURE OF

Plain and Medicated Plasters, Absorbent Cotton, Antiseptic Dressings, Ligatures, Catheters, Splints, Druggists' Sundries, Hospital Supplies, etc.

ESTD. 1883.

TRADE MARK.

Our products embrace the latest improvements in antiseptic surgery. All that scientific skill, unlimited means, years of experience and incessant watchfulness and care can do, is done to make

EVERY PACKAGE OF GOODS PERFECT

before it leaves our laboratories.

In this way we have made our trade mark an absolute guarantee of quality

WRITE FOR NEW PRICE-LIST.

J. ELLWOOD LEE CO.,

CONSHOHOCKEN, PA.

Sole Manufacturers of "ANTIZYMA."

Kindly mention AMERICAN DRUGGIST when writing to Advertisers.

to the time they made their appearance a lettered mold cost anywhere from $12 to $30 for each size of bottle desired.

Attractiveness an Aim.

In placing on the market the various new styles and modifications of prescription ware the aim of the manufacturers has been to increase the attractiveness of the bottle and at the same time to add to its adaptability for the purpose for which it is intended. The surface on which the label is attached has been constantly enlarged so as to make it easy for the whole or greater part of the label to be seen at a glance. The Philadelphia Oval is an example of an improved bottle of this description, as is the Union Oval, the Milville Round and the Seal Oval. The last named bottle is made with a flat, circular surface of limited diameter near the shoulder for the insertion of a seal, device or monogram. Numerous other styles are in existence and new ones are constantly being brought out. In all there are, perhaps, forty or fifty different styles of prescription bottles now in use, each one of which possesses certain distinctive characteristics. The shape of the neck has been altered from time to time to permit of an easier flow of the liquid, and the lip to facilitate uniformity in the size of drops.

Ointment Pots.

The general line of druggists' glassware has undergone similar improvements, the advance toward beauty of appearance, utility and convenience being well maintained throughout. In the case of ointment pots, for example, it is surely a far cry from the wooden chip box of "ye olden dayes" to the handsome glass pots with nickel plated screw caps now in use. The successive steps in the evolution of the modern ointment pot are easily described. After discarding the chip box, the hardwood turned box came into use, coincidently, perhaps, with the gallipot shaped pot of porcelain with its cover of skin or parchment paper. From that to the glass pot or box with cork cover, then to the glass pot or box with glass lids, and the glass pot with sliding tin cover were easy transitions; the culminating improvement consisting, as has been stated, of the pots of amber or opal glass, fitted with nickel plated screw caps.

Shelf Ware.

In shelf ware, tinctures and salt mouths, the first great change came with the introduction of the glass label, which replaced the paper labels formerly in use. This was followed by the invention of a bottle with a recess, into which the label was fitted. Another improvement consists in the painted label which is burned in and so made permanent, being unaffected by either acids or alkalies.

The druggist's show globe has shared in the general improvement, and few of the old fashioned glass carboys are now to be seen. Their place has been taken by combination bottles of multifarious designs, and these bottles or show globes are now giving way in turn to handsome urns and colored globes, some suspended from brackets and others arranged on pedestals.

Notes on the Development of the Export Trade in Drugs.

By a Staff Reporter.

THE first exporter of herbs, barks, leaves or other crude drugs from America is not known to history, unless we give that honor to Sir Walter Raleigh, who, we are told, acquired the tobacco habit from the natives and was so pleased with his new vice that he conceived the plan of taking a small cargo of the weed back with him to England. When trade with America was finally opened up, all the roots, barks and herbs that could be found and brought to England were carefully analyzed in the all absorbing search for newer remedies. Marvelous powers were attributed to many of these herbs, not only by the unlearned, but also by great physicians and famous chemists. That there were many clever advertisers in those days, as well as now, and that they took advantage of the ignorance of the public to exploit their wares and gather in the coin of the realm, we have not the slightest doubt, but there were also many clever, conscientious men who believed in what they stated relative to the rare medicinal value of the new drugs.

Early European Demand for American Drugs.

It was not very long until the American herbs were in such demand, and the difficulties in obtaining a supply so many, that none but the very wealthy apothecaries could afford to buy any amount of them, and the man who could proudly display any great assortment for public inspection was considered a lucky man indeed. As the demand increased in Europe for American drugs, houses were established on this side of the water for the purpose of selecting and shipping all articles suitable for the manufacture of medicinal drugs. In the beginning of the century we find this branch a most important one.

Statistics of Early Exports Lacking.

Although statistics relating to our earlier exports have never been kept, still we know our merchants had agents in all parts of the earth to whom they intrusted the task of gathering all kinds of legitimate drugs, for by this time the trade had simmered down to the roots, herbs, seeds, etc., the value of which had been proved by long use, and then shipping them to this country. In no branch of commercial activity is the development of American commerce more apparent than in this. The alertness and enterprise of the American merchant are also here manifest, for the warehouses in New York City were stocked with drugs, such as ipecac, sarsaparilla, jalap and balsams, imported from Mexico, Central America, South America, and the West Indies, and mainly designed for export to Europe. Not only were the goods brought here from all parts of the globe, but they were as widely distributed. The vessels going to the Orient for camphor, tea and other commodities brought out ginseng and other drugs much in demand there.

Tobacco the First Drug Exported.

The first indigenous drug exported was, without the slightest shadow of a doubt, tobacco. The statistics for 1830 show that 83,810 hogsheads of tobacco, which were valued at $5,586,365, were exported in that year from this country. This covers merely the leaf tobacco and does not include the manufactured products of the leaf, such as snuff, etc. How the foreign consumption of this article has increased since then is shown by the startling figures of the statistics of 1898, which give a total of 252,258,902 pounds of leaf tobacco exported, the value of which was $21,924,337, and of 10,761,580 pounds of stems and dust valued at $247,243, the total value of the product exported being $22,171,580.

The Export Trade in Ginseng.

Another article of rare value in the export trade is ginseng root. This plant is indigenous to many localities in this country, and the trade in it alone is extensive enough to cause the United States Government to specify it in the list of drugs exported. The demand for it is chiefly among the Chinese, who ascribe to it almost miraculous healing powers, believing it to be of value in every form of disease. In the statistics given for 1830 we find that the United States exported 321,692 pounds of this drug, valued at $67,852, all of which, save less than a thousand pounds, went to China. In 1894 the amount of ginseng root exported was 233,236 pounds, valued at $826,713. This was the flood tide mark in the history of the exportation of this drug, for in 1898 the amount exported decreased to 174,063 pounds, the valuation of which was $638,446. In considering the apparently low prices paid for many of these crude drugs in these early days, it will be well to remember that the purchasing value of a dollar was greater, where labor was concerned, than at the present time.

Trade in Petroleum Products.

Stone oil, or Seneca oil, now known as petroleum, was first found in West Virginia, where it rose to the surface and covered the soil in a thick, heavy, dark mass. It was locally used and very popular as a liniment. In 1829 a well was sunk in Cumberland County, Kentucky, which yielded a quantity so great as to be considered a phenomenon. As absolutely nothing was known about any method of controlling the flow of the oil, the bulk of the product from this well was wasted. A small quantity of the oil was bottled and sold in Europe as a liniment under the name of American oil. On the labels of the bottle a derrick was used as a trade mark, and, curiously enough, the device on the labels suggested the means of obtaining a sufficient quantity of the oil for refining purposes. Such was the beginning from which such an enormous industry has grown. From the first it was a medicinal remedy, and later the filtered products have proved valuable and are known as petrolatum, vaseline,

Oakland Brand Hydrogen Dioxid

"THE KIND THAT KEEPS."

GUARANTEED U. S. P.

Some Reasons Why Pharmacists Should Stock It.

PROFIT.—There is a good margin of profit in its sale—50 per cent. or more.

SAFETY.—It will keep perfectly for four to six months, corked or uncorked. There is no danger of explosion with consequent breakage of the bottle and possible destruction of property, etc.

GUARANTEED SALE.—The manufacturers stand ready at any time to replace old stock with fresh—thus in a practical way guaranteeing sale.

DETAIL WORK.—The manufacturers are doing constant and high-class detail work amongst the physicians. This work never ceases. The result is that physicians in every part of the country are interested in the solution and are prescribing it.

THE STANDARD SOLUTION.—The solution has the unequivocal endorsement of the greatest medical authorities in the country. It is to-day accepted as the standard.

THE 5-LB. BOTTLE.—This is an important feature to the pharmacist, designed for use at the prescription desk. It is sold to the trade at $1.50, and is thus as cheap as any of the inferior solutions. The regular-size bottles, sold whole over the counter, are too generally known to the pharmaceutical profession to need special mention here.

THE ONLY SOLUTION ADMITTED BY THE FRENCH GOVERNMENT.—"The French Government has incorporated in its Customs regulations a wise provision which prohibits from its markets all proprietary medicines which do not comply with the statements made on the accompanying label and with the pharmacopœial requirements of the country where the goods are manufactured. All imports are examined by expert chemists, and those which fail to pass a rigid investigation are prohibited. The fact that Oakland Hydrogen Dioxid is admitted is equivalent to a guarantee from the French Government that the article is as represented and worthy of confidence."—*Ex.*

PURITY OF SOLUTION.—Preservatives are always more or less irritating, and their presence is consequently deprecated by the medical practitioner. Oakland Brand is absolutely pure, containing no preservatives of any kind. That is why the French Government admits it.

PERMANENCE.—Oakland Brand does not need to be held together by preservatives; it is absolutely pure and consequently remains unchanged for a much greater period of time than the ordinary unstable solutions.

A SIMPLE TEST FOR STRENGTH AND PURITY OF HYDROGEN DIOXID.—(1) If the solution tastes distinctly sour, it indicates the presence of an excess of acid. (2) If it does not cause a rapid formation of froth or foam in the mouth, it is not of full strength. (3) A sweetish, acrid odor denotes the presence of preservatives, usually nitrous ether, alcohol, glycerin, etc. (4) Pure solutions have a distinctly metallic odor, probably ozonic in origin.

IN ORDERING OF YOUR JOBBER ALWAYS SPECIFY OAKLAND BRAND.

Oakland Chemical Co., 465 and 467 West Broadway, **New York.**

etc. These also have become articles of export and have a large and increasing use both in medicine and the industries.

American Oil of Peppermint

has been very much in demand in Europe, where it is used in confectionery, in many cordials, and as a medicine.

The quality of American oil of peppermint has steadily improved until the product now not only equals the best of that made in Europe, but surpasses most of it. The price of this oil was quoted at 50 cents a pound in 1804, but of recent years it has brought as high as $3 a pound. New York State had the practical monopoly in the production of oil of peppermint until a few years ago, when Michigan came into the field. The latter State has since taken the lead, and devotes more acreage to the cultivation of this plant than any place in the world. In 1894 we exported 93,879 pounds of the oil, on which a valuation of $224,716 was placed, and in 1898 the amount had increased to 145,875 pounds, but the price of the drug had fallen and the total value was but $180,811.

Difficult to Get Statistics.

Beyond the foregoing articles it is impossible to get statistics on any particular drug. All roots, herbs and barks are classed together, as are all the essential oils, with the exception of oil of peppermint. Prior to 1828 no statistics can be had at all. One of the advantages secured by the organized trade bodies that have come into existence during the past fifteen years has been the keeping of statistics and the recording of current history. If such organizations had existed one hundred years ago, the work of compilation at the present day would be comparatively easy. From the limited reports published by the Government in 1830 we can gather enough of information, however, to give a very comprehensive idea of the growth of our foreign commerce in the drug trade. In that year we find that the total value of the medicinal drugs exported was $130,238, whereas, in 1894, the exportation of medicines of all kinds amounted to about $8,000,000, the value of the ginseng being more than 10 per cent. of that amount.

Our Trade with Europe

to-day is mainly in crude drugs, with the exception of some specialties. We import much of the same again in the form of manufactured products, but the time is fast coming when we will not only cease to depend upon Europe for the supply of these articles, but will be able to supply the entire world. The natural resources of the United States are almost limitless, and when they are properly developed will furnish everything in the way of medicine. Borax has been cited often as an example. Not long ago we depended upon outside countries for its supply; to-day the deposits found in Nevada and California are extensive enough to supply the world for ages. There are others, especially those which enter into the inorganic compounds, and which are easily accessible, such as quicksilver, iron, lead, copper, zinc, aluminum, sulphur, lime, potash, soda, gold, silver, manganese, etc. With a climate ranging from frigid to torrid, the propagation of nearly all the medicinal products of the vegetable world in this country is not only possible, but practicable, with proper care.

EARLY DAYS IN BOSTON.

Sixty-one years ago I commenced life as an apothecary and obtained a situation at the store of Isaac H. Snow, at the corner of Hanover and Charter streets, at the North End, Boston. It was in a store formerly kept by a person by the name of Bartlett. There were then on Hanover street, carrying on business as apothecaries, Charles French, Thomas Restiaux, Mr. Elliot and Andrew Geyer. Seth W. Fowle was on the corner of Prince and Salem streets, James Fowle at the corner of Green and Leverett streets, Daniel Henchman and T. Larkin Turner on Cambridge street, Thomas Farrington and Theodore Metcalf on Tremont street, Ashel Boyden on Joy street, J. T. Brown, William Brown, John S. Brown and Frederick Brown on Washington street, and Thomas Hollis on Union street. The jobbing houses were Hunnewell & Co. on Commercial Wharf, Lowe & Reed, Maynard & Noyes on Merchants' Row, J. A. & W. Bird on Chatham street, Brewer, Stevens & Cushing on Washington street, Carter, Colcord & Preston and Wilson, Fairbanks & Co. on Hanover street. The North End at that time contained a nice class of inhabitants, most of them owning their own places. There was no foreign element. The population was all American families.

The pay of a boy on entering a store was for the first year $25, the next year $50, and the third year $75. Druggists had to make all their medicines from the crude drugs, powdered when necessary in the old metal mortars, and the tinctures were made by maceration. The silver money in circulation was mostly of Spanish coinage. The prices conformed to that currency. Medicines were sold for fourpence (6¼ cents) or ninepence (12½ cents) an ounce. Occasionally the old Pine Tree sixpences and shillings were brought in; they were becoming rather scarce even in those days. The scale of prices was the same with all the apothecaries; no demoralizing cutting, no attempting to do business at the expense of your neighbors. Our customers never grumbled at prices and told you that they could buy cheaper somewhere else. The store that sold ten dollars worth' a day of medicines was above the average. Liquors were not sold by us; cigars were just beginning to be sold, and in those days we could sell a nice imported cigar for three cents, paying $16 a thousand for them. Prescriptions did not call for the variety of medicines that are used now. Sometimes a prescription would be brought in calling for a hundred Dover's powders. Herbs were prescribed for by the pound. Pills were mostly made from calomel, rhubarb, ext. colocynth co., scammony and gamboge. Ointments had to be made and plasters spread much more frequently than now. Physicians diagnosed a case and then prescribed the remedy wanted from their knowledge of the Pharmacopœias and Dispensatory. The manufacturer was comparatively unknown in those days, with his hundreds of different remedies for all kinds of diseases. The remedies prescribed now by the physicians are under the particular manufacturer's name. The apothecary of to-day has to be more familiar with manufacturers' price-lists than with the Pharmacopœia. Crude drugs he has not much use for.—*Joel S. Orne in N. E. Druggist.*

Drug Store Fittings of the Nineteenth Century.

By C. H. Bangs,

Boston.

A REVIEW of drug store fitting for the cycle now so quickly to become a memory of the past seems nearly as difficult and far less pleasing to one of my temperament than a forecast of the future, which is so rich in promise of wonderful discovery in science and invention, in art and manufacture, in medicine and the thousand varied interests tending to the upbuilding and betterment of the human race. Faith in American skill leads me to believe that not many years of the coming century will have elapsed before the eyes of all the world will have turned in our direction, not with the semi-curiosity of the past but with the alert and eager gaze of those who would gather useful data from the keenest and foremost in progression yet developed. And so I turn with reluctance from the vista of a future so charged with hopes to be fulfilled to find, if possible, in the realizations of the past and present a plausible and probable ground for these hopes.

Superiority of American Store Fitting.

A few years ago I mailed a draft on London for two pounds sterling to each and all our foreign Ministers, with request to expend the amount in procuring me a photograph or drawing of the leading pharmacy in the country to which they were accredited, with a detailed description of the manner of conducting it, especially as contrasted with American methods. This resulted in my obtaining photographs of the leading pharmacies of the world. From these and from the statements of representatives of prominent journals of pharmacy abroad, whom I met at the World's Fair, it is safe to assert that the drug stores of America are admittedly the finest in the world and the most adapted to serve the purposes of the modern idea in pharmacy which America, in advance of other nations, is adopting.

In the beginning of the century drug store fitting, as far as I can learn, was practically what it has remained, with some changes, in many of the more common stores of to-day. In fact, there are still present with us some examples of the art of a hundred years ago. They were designed to serve the requirements and necessities of the pharmacist of that period; little thought was given in most cases either to the æsthetic or other sides of the question. This, indeed, is but a repetition of the experience of every trade in its early beginnings. Necessity improvises our primitive trades, institutions and tools. Competition and progress improves, remodels and rebuilds; and because we are entering upon a period of most intense competition and progression it is easy to predict for the future a constant effort toward

ONLY ONE OUT OF A THOUSAND.

CASH . . .
REGISTER
FREE

SEE PAGE 25.

Santa Rosa Cal
January. 9. 1899

Detroit Tobacco Co

I have been scalded several times. buying Cigars with Premiums. but must acknowlege that I have made up on this investment. all what I have lost on previous Investments. and the Cigars are as good. as the Brands we have to pay $35.00 per M in California. for. I would not take less than $100.00 for the Register if I could not get another

John G. Doss
Santa Rosa. Cal

CASH . . .
REGISTER
FREE

SEE PAGE 25.

"Ye Oldeste Essence Distillers."

W. J. BUSH & CO.

(INCORPORATED.)

Works: { London and Mitcham, England; Grasse, France; Messina, Sicily.

OILS OF LEMON, ORANGE, AND BERGAMOT.
(Pressed at our Messina Works.)

OILS OF LAVENDER, NEROLI, ROSEMARY, THYME, ETC.
(Distilled at our Grasse Works.)

ALL OTHER ESSENTIAL OILS.

FRUIT OILS AND FLAVORING ESSENCES.

SYNTHETIC PRODUCTS FOR SOAP AND PERFUMERY.

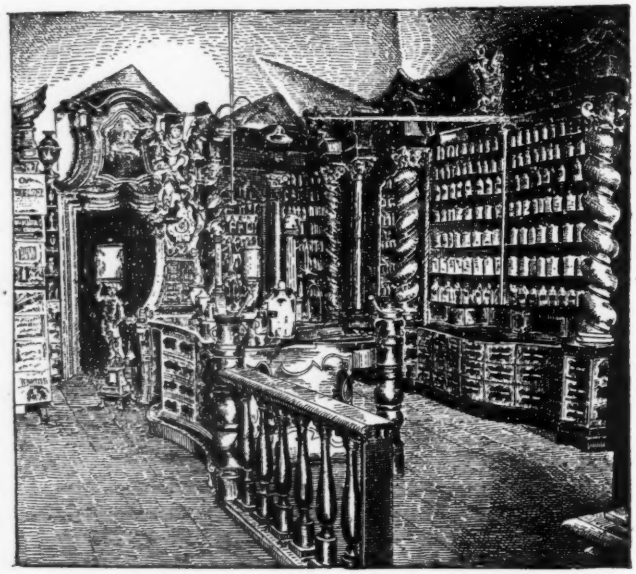
COMPOUND OILS: { FOR BAY RUM. " EAU DE COLOGNE. " VIOLET WATER.

WRITE FOR PRICE-LIST AND SAMPLES.

5 JONES LANE - NEW YORK.

Western Branch: 185 E. Kinzie Street, Chicago.

perfection in everything relating to drug store fitting. The drug store of a hundred years ago was, in many respects, a prototype of the drug stores of Europe, which were then, and still for the most part remain, chemists' shops designed to serve the wants of the chemist, who, at that time, very largely prepared his own remedies from the crude drugs, and who gave little or no attention to the sale of articles not directly connected with his own profession. From this prototype the better American pharmacy of to-day has gradually evolved to meet the increasing demands for the display and sale of articles required by a people constantly improving in wealth and means to gratify each new desire. During the century there have been a few sporadic, individual attempts at architectural and decorative embellishment, with, however, no well defined purpose other than to gratify the taste and pride of the proprietor. The result was, however, to



AN APOTHECARY'S SHOP OF YE OLDEN TYME.

bring into existence many really fine stores as compared with the contemporary conveniences and improvements of the stage coach age. How well they have since kept pace with travel and other great modern improvements I shall leave the reader to judge. The specialist in store fitting, so far as it relates to America at the beginning of the century, had not yet been born.

Advertising Value of Improved Store Fittings.

For each new demand the world may make soon or late some one comes forth to meet the challenge, and so a new industry is constantly being given birth. This new branch of business had its inception about fifteen years ago and the writer has whatever of honor and glory may be accorded to the pioneer of the enterprise. He accepts, with due meekness, the great honor and the meager emoluments, but cannot lose sight of the usual fate of the pioneer who goes forth with an axe and a torch, to blaze a path that others who follow may partake of and enjoy his discovered fields with profit and comparative ease. This brings us up and introduces us to the period of the professional drug store fitter, who has since been persistently knocking at the druggist's door for recognition, because each and every profession can be, in a measure, only what its patrons permit by their endorsement and the manner in which they encourage it; or, from another view, the ability of the profession or its individuals to impress upon and prove to the patrons the advantages it has to offer. The last fifteen years has, therefore, been more a period of education than one of very remarkable progress, except in a limited number of cases. The net result may be summed up in the fact that the business has thoroughly demonstrated its value when placed in skillful hands like that of any other advertising, of which this, if not for all trades, is, so far as the druggist is concerned, the fundamental principle, and, of all branches of advertising, is the most important and the most fruitful in results in proportion to expenditure.

Steps of Progress.

Probably the most satisfactory way of giving the reader an idea of the progress of drug store fitting for the century under circumstances allowing the store fitter latitude for securing the most desirable results will be found in a description of the second largest drug store and the one I believe to possess the best all around equipment of any in the world, both as showing the possibilities of the present and glimpses of what the future may contain. I refer to the store of Messrs. Hall & Lyon, Providence, R. I., which is under the personal management of Mr. Geo. C. Lyon. Before speaking of the store itself, I will devote a moment to the business methods. This firm has never posed as cutters. The store is located in close proximity to the large department stores of the city. It is their policy to maintain prices wherever any manufacturer is making an honest attempt to that purpose, but do not allow themselves to be undersold by their immediate neighbors, the department stores.

A Modern Instance.

Hall & Lyon's store consists of six floors and basement, all 21 by 100 feet, with a mezzanine floor about 25 by 21 feet, altogether about 15,225 feet of floor space. On the first floor is the soda department, with a soda apparatus 34 feet long, and cigar, confection, drug, perfumery and patent medicine cases. The basement contains the engine and boiler for supplying power for 500 electric lights, for running elevators and supplying power for carbonating water used at the soda apparatus, and for the manufacturing power required in the laboratory, where some two hundred preparations of their own are made.

The mezzanine floor contains the private office of Mr. Lyon, overlooking the entire first floor. The cashier's office is on this floor, the cash being received and returned through pneumatic tubes. On the second floor is the prescription department in a room entirely independent and connecting with the floor below at the drug department with a hand elevator or dumb waiter. The prescription department has practically three prescription desks in one, arranged for the united or single work of three sets of prescription clerks. Over 4000 chemicals, pills, tablets and ingredients required in the work are arranged in alphabetical order, so that any one can be found almost instantly. Altogether this is the most systematically arranged prescription department within my knowledge. The whole seven floors of this mammoth retail drug store are arranged throughout with the same methodical care as either of the departments I have described, from basement to laboratory. About $75,000 per year of goods of their own manufacture are sold, consisting of some two hundred different articles. Sales as high as $2300 have been made in a single day, all at retail, and this in a city of only about 150,000 inhabitants. When this is contrasted with the chemist's and druggist's outfit of a hundred years ago, it gives some indication of the changes in the store fitting of today and the change in the methods and the possibilities of the future for the druggist who conducts his business on broad advertising lines.

Modern Drug Store Architecture a Means of Advertising.

In the past the druggist has been, owing to the technical and professional requirements of the business, in a large measure immune from serious competition outside his own ranks. To-day the lines have been broken over, both from without and within, till he is forced to face a competition as great, and, in many respects, more disagreeable than that of any other trade. This has placed before him one of two alternatives—either to enter the field of advertising with other progressive trades, or to stand by passively and see everything but the purely technical part of his business swept away. The most effective advertising he can then do is to beautify his store, and here is where the services of the experienced drug store fitter will be called into requisition.

THE PENNIES WILL DROP INTO A

ZENO

Automatic Vending Machine.

You can get one

FREE

with 1000 Penny Pieces assorted

ZENO CHEWING GUM

Pepsin
Peppermint
Lemonade
Pineapple
Yucca
Licorice
Vanilla Cream

Price, Complete, $8.00.

Gum to refill 55c. per box.
For sale by all jobbers.

ZENO MANUFACTURING CO., CHICAGO, ILL.

WHY BUY EXPENSIVE CHOCOLATE SYRUPS when you can make the most delicious syrup at 40 cents a gallon by using

Runkel Brothers'

Essence of (Powdered)

CHOCOLATE?

Soluble, Strongest and Best Flavored.

Packed in 5, 10 and 25 pound cans at 40 cents a pound. For large quantities prices quoted on application.

For Samples Address

RUNKEL BROS., NEW YORK.

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Kindly mention AMERICAN DRUGGIST when writing to Advertisers.

DESIGNS FOR MODERN DRUG STORES.

The following descriptions and plans for modern drug stores were prepared respectively by a firm of store fitters and a retail druggist. They are designed for cities of from 5000 to 20,000 inhabitants, and are good examples of the growth and development of the art of store fitting. The article and plans by Mr. Foote, who is a young and enterprising druggist of Archbald, Pa., are given first, as showing the druggist's own idea of what is suited to his needs. It will be read with interest in connection with the paper by the New York Store Fixture Company, which follows on nearly identical lines, but shows, of course, a greater familiarity with technical details, and even anticipates more fully the actual needs and conveniences of the pharmacist.

An Ideal Drug Store

For a City of From 5,000 to 20,000 Inhabitants.

BY JOHN A. FOOTE.

Archbald, Pa.

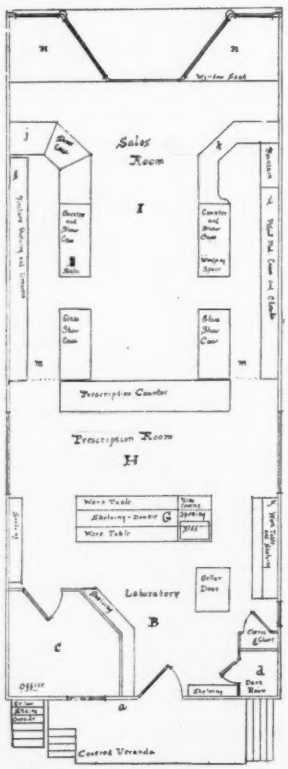
THE average druggist not only works but practically lives in his store. There are few other professions, and there certainly is no other branch of mercantile labor, in which such long hours of work and such close and intimate association and identification with the pursuit are demanded by clients or customers. Thus it is that the druggist finds that the smallest relaxation of personal attention to his business—even for wholesome and necessary recreation—will hardly be allowed him by the selfish public. Since, then, the druggist must perforce live in his store the greater part of his days it is to be expected that he will learn from that hoary-headed teacher, Experience, what the discomforts of his environment are; and, as he gains from experience and grows in wisdom, that he will devise means of removing these obstacles to his dignified race in pursuit of happiness.

There is one country where building strikes are unknown—the land of fancy—and he is a poor pharmacist who has not builded in that happy realm a model of his Ideal Drug Store; the kind of a store he would build if he could do his building all over again. The ideas which are here expressed are nearly all in practical use to a greater or lesser extent in this neighborhood, and so need not be considered as mere theories from that "happy land."

It is assumed that the ideal store will be a new building constructed with a view to meeting the exact requirements of the druggist who is to occupy it. The plan submitted calls for a building 20 by 50 feet. The first consideration will be the cellar. Let there be no false economy in the depth or the height of the outside wall above grade. Let the stonework show above the ground high enough to allow a generous distribution of windows to let light in the cellar. If at all possible the floor should be concrete. If the store is to be heated with a hot air furnace the cellar must be sufficiently deep to give the air pipes the required angle for conducting the air which the furnace radiates.

Attached to the rear of the building is a covered veranda (a) six feet deep, and extending in length from the stairway or step which connects it with the alley on the right of the building to the stairway or step which leads to the outside cellar opening on the left. This veranda will be found of great value for receiving shipments of goods from draymen or carriers, and freight shipments that are too cumbersome to be taken inside may be unpacked here even in rainy weather.

From the veranda we come to the stockroom and laboratory (b). In the left hand corner as we enter the laboratory from the rear is the private office (c). It is about 7½ x 8, small, but cozily furnished. This should be the druggist's parlor, so to speak, and it should be



FLOOR PLAN OF IDEAL DRUG STORE.

neatly carpeted, provided with a couple of comfortable chairs in addition to the usual desk, and the walls hung with some neatly framed pictures. To be brief, it should be just like a comfortable corner stolen from the druggist's home; a place the druggist may retire to when he wishes to peruse his favorite drug journal; where he may bring his customers to discuss their accounts without giving the other persons who may happen to be in the store at the time unnecessary knowledge; where he may lure the timid and retiring commercial traveler into giving him "inside figures." Note that the office can be entered from the store without disturbing those who work in the prescription room, by taking the right hand entrance between the counters.

In the opposite corner is a photographer's dark room (d), constructed after the plan which I contributed to the AMERICAN DRUGGIST of Nov. 25, 1899. Druggists who do not deal in photographic supplies might have a toilet room in this space. On one side of the dark room is a clothes closet (e), a very necessary convenience in a neatly kept drug store. Hats, coats, overcoats, umbrellas, etc., can be kept not only out of the dust but out of the way. A window adjoining the clothes closet, together with the glass in the laboratory door, furnishes abundant light.

A working table (f), supplied with stock drawers and cupboards, and surmounted by a section of shelving, occupies the space between this window and the large one on the right of the prescription department. Prescription files may be preserved in these closets or cupboards free from dust.

A double working table (g), surmounted by shelving, with drawers and cupboards on both sides, divides the prescription room from the laboratory.

To conform to the plan of this store it will be necessary to place the sink on the right side of the working bench. Drawers with closets underneath them should be placed under the working table in the laboratory, as the table will doubtless be used for percolating operations, etc., and the percolaters and material can be kept in the closets when not in use. If desirable a working bench might be made on the part facing the prescription room by simply making the lower part of the fixture a double width counter and placing the shelving in the center, with an equal space on either side of it.

The prescription department (h) is the most important department of the retail drug store. Therefore it should be roomy, conveniently located and furnished with an abundance of light. By reference to the floor plan you will observe that there is about six and one-half feet of floor space between the prescription counter and the working bench behind it. Since all of the rougher work of the store (which is often crowded by lack of room into the little space which some druggists give to this department) will be done in the laboratory, this will give ample room for two men or more to work. The counter is about 12 feet long; oak top, with three slides for folding powders and a 4-foot slab of marble bedded in the top. Drawers and closets for corks, bottles, etc., are underneath, and a small desk for writing labels is on the right of this counter. Two large windows, 6 by 8 feet, furnish plenty of light. In both prescription room and laboratory the floor should be covered with plain linoleum of some dark color.

The store proper (i) is a room 20 by 26 feet. The ceiling is 12 feet high, and both ceiling and walls may be covered with stamped steel paneling without an excessive cost over the rate for matched wood or plaster coverings. The floor outside the counters is covered with linoleum made in imitation of mosaic tiling, which may be purchased at from $1.25 to $1.50 a square yard, and is very durable.

Fixtures may be of mahogany, quartered oak, plain oak, cherry, ash or softer wood painted or enameled. Mahogany is the most expensive wood, but presents a rich appearance and does not show marks of usage as easily as a lighter hued wood. Cherry presents the same advantages as mahogany. Quar-

The practitioner finds that with the Automatic Cap there is no loss of time and no trouble in controlling the spray. Write for prices.

KELENE
(Pure Chloride of Ethyl)

No stopper to stick—no trouble. Grasp it and the warmth of the hand sprays your favorite perfume

OIL OF ROSE,
$4.00 (Synthetic) AN OZ.

RHODINOL II.
Replaces perfectly the natural oil. For sale by all first-class Wholesalers or mailed postpaid upon receipt of price

50c. per oz
External or Internal Rheumatism Remedy
RHEUMACILATE,
Chemically Pure Salicylate of Methyl

ANTIPYRINE C. P.
$2.50 per Vial.
ORGANO SERUM
50 cts. per Vial. 30 c. c.

RESORCIN, COUMARIN, HELIOTROPINE, WINTERGREEN, ETC.

GAIACOPHOSPHAL
(Phosphite of Guaiacol).
PHOSPHOTAL
(Phosphite of Creosote).

FORMALDEHYDE GAS
when properly used **DISINFECTS.**
FORMALDEHYDE
TREATISE mailed gratis. Write for one.

NEURALGIA AND HEADACHE
Relieved immediately by use of
MENTHOL-KELENE AUTOSPRAYS

Write for our book on Synthetical Perfumes and list of Products. When writing your jobber always specify "FRIES BROS." to get the best.

FRIES BROS.,
Mfg. Chemists,
92 Reade Street,
New York

$1.50 oz.

LANCE FRENCH PERFUME AUTOSPRAY

Handsomely packed; suitable for gifts.

Mailed on receipt of $1.00

550 Times Sweeter than Sugar
GLYCOSINE.
Most Powerful, Agreeable and Cheapest Sweetener.
$1.50 oz.

BEWARE OF SUBSTITUTION OF REFINED VANILLIN.
Sample Oz., sufficient for a gallon of strong Vanilla Extract, mailed upon receipt of price.
Special prices on larger quantities or contracts.

WARNING!
WE WILL NOT SELL TO EVERY WHOLESALER.

If your jobber has been cut from our list, please write, and any and all information will be cheerfully given

Beware of those jobbers who will recommend an inferior article for personal gains.

Send for the Franklin Institute's report giving the reasons why our scales are **More Accurate, More Durable, More Sensitive,** than any knife edged Scales can be made; also for our Illustrated Catalogue

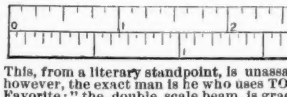
Style 276—$15.00.

THE FIRST PRINCIPLE
of pharmacy is accuracy. It is impossible to observe this principle with inaccurate scales. That stands to reason. If a scale has knife-edges and parts that wear, it's easy to see that it cannot be accurate for any length of time.

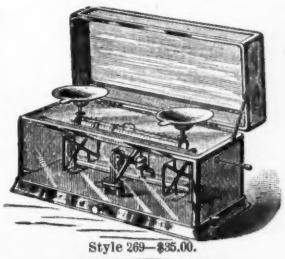
THE TORSION BALANCE
is accurate and remains accurate forever, because it's built right—it's built to stand use.

It has no Knife-Edges—No Parts that Rub.
That's the whole secret. Druggists who use them won't have any other kind. Write for a catalogue.

The Springer Torsion Balance Co.
92 READE ST., NEW YORK.



The Exact Man
According to Lord Bacon, writing makes an exact man. This, from a literary standpoint, is unassailable. In the practice of pharmacy, however, the exact man is he who uses TORSION BALANCES. No. 269 is "The Favorite;" the double scale beam is graduated to ¼ grain and to 0.005 gram; the balances are sensitive to 1-64 grain, and may be loaded with 8 oz. without injury. Forty other styles for all purposes. Book free. This is the best prescription balance ever made. Buy it and be known as The Exact Pharmacist.

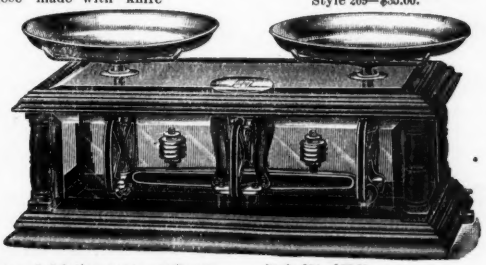


Style 269—$35.00.

Style 270—$25.00.

Which?
Do you want an absolutely accurate scale or a "near-enough" scale? Those made with knife edges and friction parts are "near-enough" scales. They do for some things, but not for drugs. They wear out—that's the trouble.

A pharmacist should have a scale that never wears out—that never becomes inaccurate.



Style 251—$85.00.

Style 271—$20.00.

Style 206—$12.50.

The Torsion Balance Scale is the only scale that use does not change. It is the only scale made on the non-deteriorating principle.

No Knife-Edges, No Parts that Rub, No Wear. "Have a Scale that you can swear by."

If you want to know more about the interesting principle of balance, send for a catalogue. Send to day.

Style 277—$12.50.

SPRINGER TORSION BALANCE CO., 92 Reade St., New York.

A COZY CORNER IN THE DRUG STORE.

tered oak makes a light, cheerful display and is not so expensive as mahogany. I have seen a very rich-looking set of quartered oak fixtures made for a store of the size I speak of at a cost of $750. It is not always the maker with the largest business who makes the best and cheapest fixtures; but the buyer should guard in his contract against probable warping of the wood, opening of seams, checking of the finish, etc., and hold the dealer responsible against these defects. An octagonal show case (j) is on one side of the store, an octagonal soda counter (k) on the other. It will be noticed that ingress to the prescription department can only be obtained by going behind the counters, as the openings are placed in the middle of the store. This will partly check the "smart man" that wants to go behind the prescription case and talk to the druggist. Tincture shelving with drawers underneath and patent medicine cases with closets (ll) are ranged on either side of the store.

The same design used in the wall cases and shelving will be carried out in the prescription case. The upper part of the case will be of an equal height with the side cases and shelving and will be connected with them by arches (m m), which may be curtained. All cases and closets are provided with sliding doors to economize space.

The object of this paper is to tell of an ideal store from the viewpoint of convenience and utility to the druggist, so I will not attempt to say what style of fixtures should be used. But let the design be simple, not overburdened with stampings and carvings, and the effect will be all the more striking. Simple paneling for the wood counters, a Colonial cornice and frieze at top of wall cases, extending over the arches and continuing on the prescription case, and a judicious use of mirrors, will make a neat and attractive ensemble. The large show windows (n n) should have for their background mirrors set in a frame extending across and sliding up and down in grooves, and operated by weights like a window. There should be an upholstered seat on the window ledge, near the soda fountain.

Given a proper building, a store such as I have attempted to describe may be equipped at a maximum cost of $1,500, including shelf ware, working utensils, and, in fact, everything excepting stock and soda fountain.

Model Fixtures for Ideal Drug Store.

BY FISCHER BROTHERS,

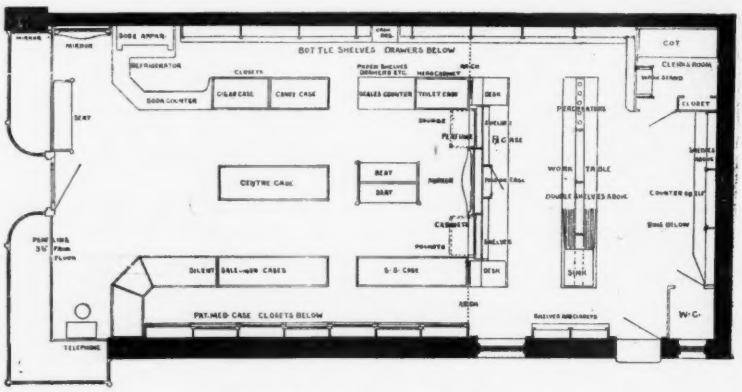
Proprietors of the New York Store Fixture Co.

THE subjoined plan and description of fixtures are designed for an ideal drug store in towns of from two to ten thousand inhabitants.

A drug store should by all means be located on the corner. Our floor plan shows a building having a floor space of 25 x 50 feet, which is about the usual size. The show windows are rounded off at the corners near the entrance, which latter consist of a single three foot door. The windows are paneled to a height of 3 feet 6 inches from the floor, as shown in the drawing, while a mirror against the wall in one of the windows reflects the goods displayed. The soda-water apparatus is placed on this side of the store, because there it can be best seen by people coming along the street. The apparatus rests on a refrigerator filled with mineral wool and lined throughout with zinc, which rests on top of the soda counter. The latter is octagonal in shape and is fitted with a marble top. Between the counter and the show window there is a large mirror with frame to match the balance of the fixtures. At this side the counters continue up to the front of the prescription case, an opening being provided next to the scales counter. The tops of counters are intended to hold a number of show cases. Next to the soda counter are a cigar case, a candy case and a toilet article display case, taking up space from one end of the dispensing counter to the front of the prescription case. The parts behind the counters are arranged with lockers under the cases. Paper shelves, label and other drawers are provided for under the dispensing counter, and an herb cabinet takes up the balance of the available space. Bottle shelving and drawers are arranged on this side of the store, since most of the business is done here. The drawer case should be made mouseproof and each drawer slides into a solid compartment.

Octagon shaped Silent Salesman cases are used for the opposite side of the store to give an appearance of symmetry. They are continued up to the prescription case, with openings to correspond with the dispensing counter side. The space in front may be used advantageously for a telephone table.

The store being wide enough, a centre case of the silent salesman type can be used to make an attractive display of all kinds of articles, and a double settee is provided for the empty space behind. The use of a settee does away with the wearing off of counter fronts by backs of chairs, and this article of furniture is both ornamental and comfortable. Patent medicines are a big item in a drug store, and the cases along the wall of side street are devoted to their display, sliding doors being used both in the upper and lower parts. The doors are nicely paneled, the upper parts being glazed with clear glass. Sliding doors possess a great many advantages over the old-fashioned swing doors; they are easily opened and closed, are never in the way of clerks behind the counters, and will, if taken care of, never get out of order. The prescription case is made of the same height as the wall fixtures, and is connected with them at either side by an arch. The center of the case is arranged with a large mirror, having perfume cases at either side; sponge pockets are placed below the perfume cases. The inside work of the prescription case is arranged with a working top of hardwood, with slides, label and other drawers underneath and a locker at either end. The upper part is filled with shelves and has a poison case in the centre, while at each end a desk is provided, a window at the side giving plenty of light. Between the window and door shelves and closets are built. A work table is placed in the centre of the prescription department arranged with double shelves in the upper part, with racks for percolators, a sink at one end of the table, while the lower part may be arranged with closets. Shelving with lower bins is placed against the rear wall, and in one corner provision is made for the clerk's sleeping apartment, which is partitioned off from the rest of the store.



FISCHER BROS' MODEL PLAN.

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